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CROSS-SECTIONAL REVIEW OF MORBIDITY AMONG YOUNG SOLDIERS

BY

S. ROSENBAUM

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Introduction

The term cross-sectional implies that, for a period such as a month or a year, one is considering all cases that occur during that period; when the population is changing, the cases in different periods are from different (though it may be similar) risk groups. Contrasted with this is the term longitudinal, which implies the follow-up of individuals, that is to say continuous histories. A longitudinal survey retains a clinical flavour, since the results directly portray the progress of individuals, but a cross-sectional survey is a purely statistical concept, examining some impersonal subject such as the Army, which is certainly an entity, but whose composition in terms of soldiers has a turnover of a third every year. Of course there is an overlap in the results thrown up by both methods of approach, especially when the qualities of the population remain constant from year to year. This is, in fact, exploited in the cohort type of analysis, where a group studied in one year is linked with an older group studied in a later year, thus simulating a longitudinal study.

The morbidity experience of the Army is most easily measured in terms of annual or monthly rates of sickness, that is number of cases related to numbers at risk (liable to be reckoned as cases). The latter definition, including as it does a vastly varying population, deserves closer examination that it often receives. After all, it may be said, the victims of a train crash can only come from people who ride on trains; why suppose that anyone else is at risk? The answer is first that such clear designations of a population sub-group are rarely obtainable in practice; secondly that when the population structure remains fairly constant, the experience of one sector of it will be reflected faithfully even if mildly in the experience of the whole; and thirdly that rates measured in this way reveal a stability of behaviour with respect to random causes that gives them great value in the practical and predictive sense. The interpretation of a changing rate is far more frequently to be found in the changing circumstances of the population at risk than in the casualties themselves; thus the proportion of train crash victims among the population at large increased as more people used the railways, not because the human frame became more susceptible to flying debris.

Population at Risk

We must now seek to specify the population at risk which is the subject of this review, and whose morbidity experience can be taken to represent the state of health of National Servicemen. National Service goes back to just before the war, to the summer of 1939, when the conscripts were commonly spoken of as militiamen. At that time the age at call-up was 20, and the period of service, with the outbreak of war, stretched to 6 years and more. At the end of the war men were being called up for much briefer periods. By 1948 a number of Acts of Parliament had been passed which were consolidated into the National Service Act of July 30, 1948, providing for a boy's call-up (with exceptions) on reaching the age of 18, for a whole-time service of one year. This was amended from December 16 of the same year to a period of 18 months, and subsequently from September 18, 1950, to 2 years. (These Acts are jointly known as the National Service Acts 1948 to 1950.)

Meanwhile the strength of the Army had run down by 1949 to under half a million men, and remained at about this level for another 8 years or so. During this period also the National Service and Regular elements were more or less balanced, and although since 1952 with the introduction of a 3-year Regular engagement a considerable proportion of National Servicemen signed on for a third year, they were in a

sense doing an extended form of National Service, since many would not have become soldiers without it. By 1957 these two classes actually accounted for about three-quarters of the Army strength. The inclusion of the remainder does not raise the average age of the whole Army much above that for the National Servicemen alone, and it is reasonable to suppose that the average morbidity experience for the whole Army reflects the morbidity of National Servicemen alone. This is borne out by actual comparisons; for example, a count of in-patient records for all diseases in the United Kingdom in 1954 produced a rate for National Servicemen of 18 per cent. of strength as against a rate for Regulars of 17 per cent.

From several points of view, this study is best based on the 7-year period from 1950 to 1956. It was a period when the run-down of the large war-time Army had been completed, and a fairly stable composition had been reached in regard to age and the service structure in the Army. From 1956, a rather later call-up age was gradually being introduced with the object of contracting the Army, and National Service was made more selective with regard to medical standards.

This period is also convenient from the point of view of control charts, discussed below.

Morbidity Rates

Importance of Geographical Differences.—Morbidity rates form an index to the health of the Army, which can be regarded in the manner of a control chart as a guide to preventive measures and a yardstick of their success. Examples of charts are given in Fig. 1 (opposite) allowing for observations on a monthly basis against the background of knowledge of the preceding 7 years. No account is taken of age, since we are dealing with a fairly narrow age-group (and of one sex) which is scarcely changing in composition during this time. It is also of convenience from the point of view of making probability statements: avoiding the inadequate basis of binomial probabilities for fixing limits, we can use the observations themselves in the following way. The two maximum and two minimum rates for the 7 years are plotted as a pair of outer and inner limits, and form boundaries such that one in eight of subsequent observations may be expected to be record high ones, and another one in eight record low ones; half the subsequent observations may be expected to lie within the inner limits. These localized extrema, it must be repeated, have engaged our attention because in a longer period the homogeneity of the population vanishes (quite apart from the inevitable changes in the collection of data; before the war, for example, many cases would have been treated as "sick in barracks").

The rates have been calculated quite simply from returns of admissions to hospital supplied monthly by all Army medical units (and civilian hospitals treating Army patients), while the numbers at risk were obtained from a monthly census. There is a long history of morbidity measurement in the Army, similar to that of mortality in civilian terms; both were founded by the same generation of early Victorian pioneers in medical statistics, and it was immediately seen that the Army gave the opportunity for the numbers of cases of diseases and of persons at risk to be known with some certainty, so that a precise measure of sickness could be made. This is an index to disease just as mortality is, though with a very different emphasis, and a less sharply-defined boundary, but nevertheless in Army terms a fairly consistent one, the criterion being a stay of over 48 hours in a medical unit.

We look first to total admission rates to show the level of morbidity in the Army. In a relatively brief period such as we have chosen, the composition of the total admissions in terms of particular diseases is reasonably stable, whereas over longer periods different groups come to dominate the picture as do respiratory conditions in Great Britain to-day. Table I shows the total admission rates for the chosen 7 years in the United Kingdom, and in each of the three main commands overseas where the overwhelming majority of troops have served, the British Army of the Rhine (B.A.O.R), the Middle East Land Forces (MELF), and the Far East Land Forces (FARELF).

Table I

TOTAL ADMISSIONS OF BRITISH ARMY IN MAIN COMMANDS, 1950–1956
RATES PER 1,000 STRENGTH

Command	1950	1951	1952	1953	1954	1955	1956	Average	Range
UK	310	314	307	338	286	265	256	297	82
BAOR	371	360	280	296	267	276	232	297	139
MELF	461	443	399	372	284	298	327	369	177
FARELF	674	623	510	474	470	387	443	512	287
Range	364	309	230	178	203	122	211		

MONTHLY RATES OF ADMISSIONS PER THOUSAND STRENGTH

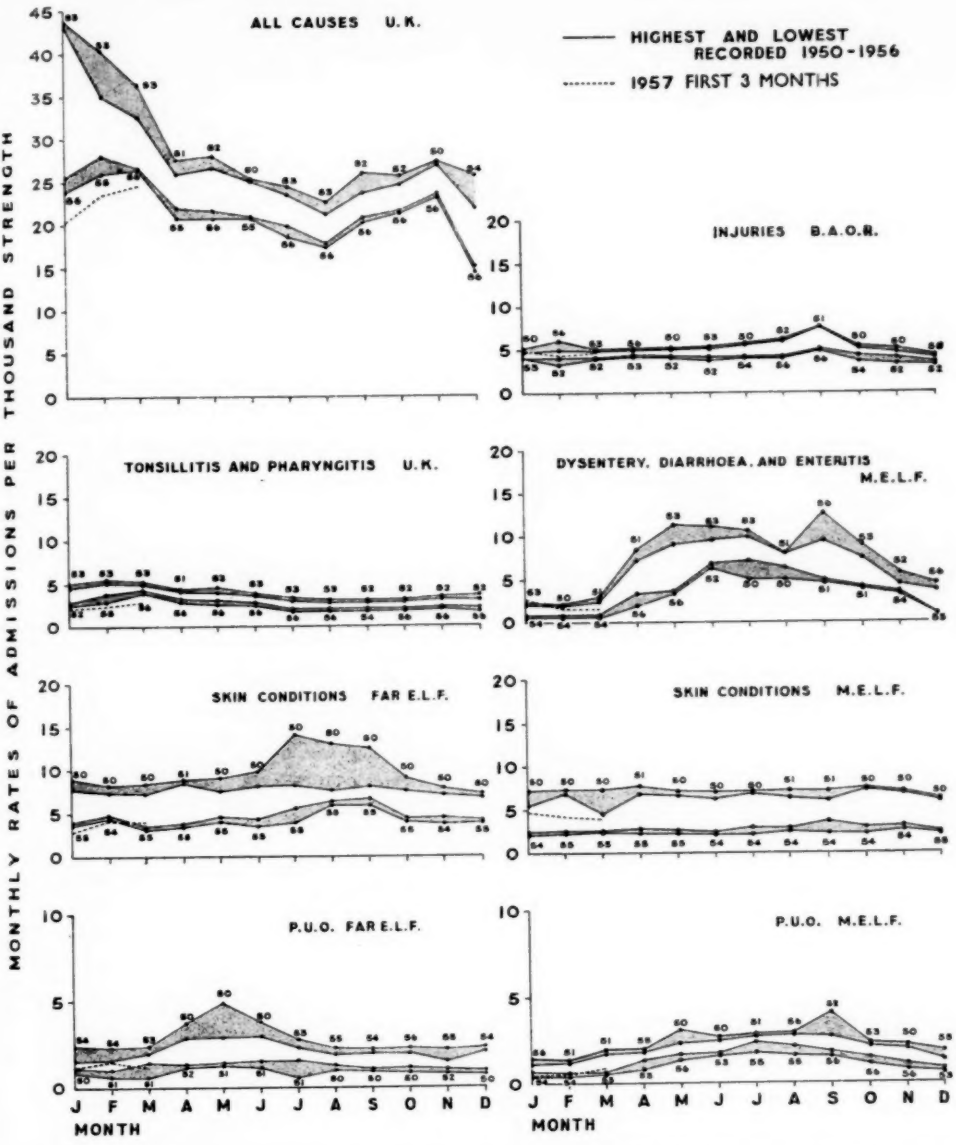
ALL CAUSES U.K.
HIGHEST AND LOWEST RECORDED 1950-1956
1957 FIRST 3 MONTHS
INJURIES B.A.O.R.
TONSILLITIS AND PHARYNGITIS U.K.
DYSENTERY, DIARRHOEA, AND ENTERITIS M.E.L.F.
SKIN CONDITIONS FAR E.L.F.
SKIN CONDITIONS M.E.L.F.
P.U.O. FAR E.L.F.
P.U.O. M.E.L.F.
MONTHLY RATES OF ADMISSIONS PER THOUSAND STRENGTH
J F M A M J J A S O N D
MONTH

FIG. 1.—Monthly rates per 1,000 strength of admissions of British Army males to all medical units in the first 3 months of 1957, with the two maximum and two minimum rates between 1950 and 1956.

It is to be expected that, on account of random causes alone, an average of one year in eight will lie in each of the shaded areas and in each extreme region outside them. Care should be taken in combining observations, because neighbouring months may be correlated in diseases with seasonal effects, and cannot therefore give independent evidence.

Ranges are given between years and between commands, from which standard deviations can be estimated approximately (allowing for the fact that there are seven years and only four commands) as 110 between commands and 60 between years. From this it is evident that geographical differences were far greater than differences between years, over a short period. Indeed sickness as a whole was surprisingly stable, especially in the United Kingdom.

It must be interpolated here that civilian figures for comparison with these do not exist. There is no equivalent in the Army to staying at home in bed for a few days home nursing, so the soldier has to go to hospital when a civilian with the same complaint would not. Even those civilian hospital statistics which are published, generally cannot be related to numbers at risk in the same way as for soldiers. When it is possible to see the relative importance of diseases without knowing the absolute rates, as in the General Register Office Study (Mackay, 1951) which relates to the first half of 1949, it is seen that less severe diseases such as respiratory diseases and skin diseases are more prominent in the Army figures while tuberculosis and peptic ulcers for example are higher for civilians (in approximately the same age group). But there is a more difficult obstacle. National Service was universal for the fittest 80 per cent. of the young male population, apart from some reserved occupations; it is therefore impossible to know what might have been the morbidity had they remained civilians, even if an organization existed for collecting the information. The universality of service does not permit the existence of a control group. It serves, incidentally, to underline the importance of these young men to the health of the nation, both in the morbidity experienced, and in their bequest to later years as civilians again; two-thirds of them it should be said passed through the Army's ranks.

From the figures of Table I it is possible to detect trends in the seven years, almost invariably of improvement; this is also seen in the charts where the upper limits are usually of the earlier years. But, as already pointed out, it is the geographical difference which is the governing factor: in Europe there was an annual admission rate of 30 per cent. of strength, whereas in the Far East the rate reached 50 per cent.

INJURIES.—The next step is to break down the overall rates to see which diseases cause most wastage, and which show a preference for different countries. Inevitably we must consider injuries, as a major preventable source of wastage, and one where the soldier runs his own occupational hazards, especially in time of war. Injuries formed about one-eighth of all admissions, and remained remarkably constant from year to year; here indeed the independent play of chance approaches somewhat nearer the classical model than among the infectious diseases. The average rates for the seven years, per 1,000 strength, were as follows:

UK	35·7
BAOR	56·5
MELF	40·1
FARELF	53·9

The standard deviation between commands is about 10·5; that between years is about 4·5.

The point to be made here is that the commands do not follow the same order as for all admissions. Germany had the highest rate (and it may be noted that Austria had a higher rate still). This cannot be more than partially attributed to traffic accidents, and some other cause must be operating, perhaps training. This is undoubtedly true if sport comes under that heading, for injuries at sport are far more numerous than any other single cause including traffic accidents, though they are less severe than those suffered through traffic accidents. A detailed survey of injuries and their causes has been made in the Report on the Health of the Army for 1954 (1958).

DISEASES.—Apart from injuries, and using the term "diseases" to their exclusion, we can put the spotlight upon the main health problems by listing those rates which amount to about one per cent. of strength or more when averaged over the 7 years; this is done in Table II. (For more detail, see Appendix.)

TABLE II

DISEASES WITH AN AVERAGE RATE ABOUT ONE PER CENT. OF STRENGTH OR MORE ADMISSION RATES PER 1,000 AVERAGED OVER THE 7 YEARS 1950–1956

Disease	UK	BAOR	MELF	FARELF
Respiratory ..	**88**	46	46	42
Otitis Externa and Media ..	—	—	10	16
Skin	33	42	52	74
Venereal	—	14	16	98
Intestinal ..	—	—	**66**	40
Pyrexia of Unknown Origin (P.U.O.)	—	—	21	20
Malaria	—	—	—	9
All Diseases ..	261	241	329	458

Clearly the respiratory diseases stand out in the U.K. and skin conditions in the Far East, where if it were not for venereal diseases they would be the leading cause of illness.

Venereal Diseases.—These are in a special category in the reporting procedure, as every single case during this period was counted whether admitted as an in-patient or not, and they therefore have an enhanced prominence in the morbidity tables beyond their true importance; gonorrhoea, which supplies the majority of cases, has little need of in-patient treatment. The reduced importance of venereal diseases as a medical problem has been accompanied by shifts in the relative balance of types of infection. The Far East had a large proportion of chancroid, which was about a quarter of all cases in 1949, but dropped to a fifteenth by the end of our period. Even more interesting has been the changing ratio between gonorrhoea and non-gonococcal urethritis, smear tests for which were almost always carried out. In the Far East, the ratio, which was about 3 to 1 soon after the war, fell to 1·7 in 1950 and 0·9 in 1956; while in Great Britain it was 2 to 1 soon after the war, falling to 1·3 in 1950 and 0·3 in 1956. One might speculate whether the widespread use of penicillin for other purposes in the treatment of disease might have had a prophylactic effect upon the gonococcus; the difference between the theatres perhaps corresponding to different levels of protection in the host populations. At the same time no protection has been afforded against non-gonococcal urethritis. A similar fall is recorded in early syphilis, from 10 per cent. of the venereal diseases in the Far East soon after the war to 5 per cent. at the beginning of our period and 1 or 2 per cent. at the end; and in Great Britain from 19 per cent. soon after the war to 7 per cent. at the beginning of this period and 4 per cent. at the end.

Skin Diseases.—If the venereal diseases are excluded, the Far East rates were not so very much higher than those in the Middle East, the greatest excess being in skin conditions. These were of great importance in all commands, and were largely governed by the group of septic conditions such as boils and cellulitis, which averaged about 21 per 1,000 in the European commands and 32 per 1,000 in the tropical commands. The variation between years was higher in this particular case than between commands, in fact, a substantial decrease took place during the period, and the geographical variation was quite small at the end of it.

The principal addition in the Far East was from tinea, which was uncommon elsewhere but there reached the proportion of one-fifth of all skin conditions. Even this conceals its widespread extent, for large numbers who did not become in-patients were treated at medical centres as out-patients (if they had been documented in the same way as venereal diseases the latter would appear much less important). At the time of one investigation in the late summer of 1956, tinea pedis in the Far East was causing a first attendance at medical centres every week of one in fifty men. It was particularly prevalent in Malaya, although skin conditions as a whole seemed to be more frequent in Hong Kong. Presumably the local conditions of heat and damp, not to speak of operational needs, were responsible for the efflorescence of these complaints; it was shown in a trial of foot powders that the potential for tinea existed among reinforcements before the troops even reached the theatre. The evidence was that effective measures to deal with tinea pedis had to be considered in terms of hygiene rather than in terms of the chemical composition of a particular foot powder.

In the Middle East, where the heat is dry (and at times dusty), skin conditions were at their maximum from July to November, but even the month of lowest incidence (March) was only a fraction below the average. (The reference to dust may be misleading; the *khamsin*, the "50-day" sand wind, blows intermittently from March to May). This steadiness of incidence throughout the year appeared equally in Europe and at home, with only a slight rise in the autumn coinciding perhaps with manoeuvres.

Otitis Externa and Media.—Table II shows that a tropical climate, and particularly the Far Eastern one, also favours the onset of otitis externa and media, a group of diseases which should perhaps more properly be split so that the first is considered with the skin conditions, and the second with the throat infections. This is supported by the incidence rates (which are available separately only from 1952 onwards) shown in Table III.

TABLE III

AVERAGE ANNUAL ADMISSION RATES WITH OTITIS PER 1,000, 1952–1956

Command	Otitis	
	Externa	Media
UK	1·4	3·5
BAOR	1·5	3·1
MELF	4·4	4·3
FARELF	8·2	5·5

Otitis media does not vary greatly between commands, but otitis externa, which is only half as extensive in the United Kingdom and Germany, is equally extensive in the Middle East, and almost double in the Far East.

Respiratory Diseases.—The mention of throat infections in connexion with otitis media brings us to the consideration of respiratory conditions, which are shown in Table II to be as frequent as skin conditions. Their relative numerical importance depends on the definitions. Such comparisons can under-rate certain rarer diseases such as tuberculosis and rheumatic fever, which cause great wastage in terms of man-days. The groups used here for skin diseases and respiratory diseases are reasonably equivalent in this respect, since the average stay in hospital is about 11 or 12 days for each.

Streptococcal sore throat and scarlet fever have been omitted from the respiratory group, but their reported rates are low, perhaps in the former case because of the absence of a routine for isolating the organism. The respiratory diseases include five subgroups in order of rate:

Respiratory Diseases	*International List No.*
Tonsillitis and Pharyngitis ..	472–473
Common Cold	470
Influenza	480–483
Bronchitis	500–502
Pneumonia	490–493

Table II shows that the United Kingdom is twice as vulnerable as elsewhere, but this is mainly due to the common cold and influenza. The rates of tonsillitis and pharyngitis in the Middle East are surprisingly high, of the same order as in Great Britain and rather greater than in Germany, where the seasonal distribution is more similar to that of the Middle East than to that of the United Kingdom (where there is simply the expected winter peak), and has an additional peak in the late summer (Fig. 2). Once again, in the Middle East the *khamsin* has no apparent connexion in time which might implicate the excessive dust it raises as an irritant.

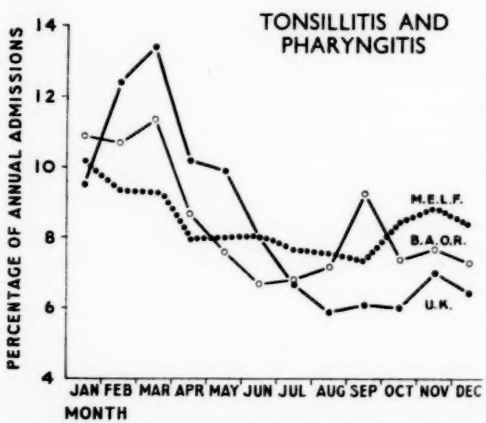

FIG. 2.—Monthly percentage of annual admission rates for tonsillitis and pharyngitis, averaged over 1950–1956. (See Tables N, O, and P of Appendix.)

In the United Kingdom, the expected winter peak for tonsillitis and pharyngitis, already mentioned, is less pronounced than for other respiratory conditions. Influenza represents the most acutely epidemic form, concentrated often in one of the months between January and March, as for example in 1951, when half the year's total incidence was experienced in January; these first 3 months of the year account for two-thirds of the cases, and the period from May to September for only one-eighth. A study of the preceding monthly rates appears to afford no clue to the ensuing epidemic; probably a weekly return would be needed for this purpose. Common colds follow a modified version of the same seasonal pattern, and so also do bronchitis and pneumonia.

As one would expect, influenza fluctuates considerably from year to year, and causes a similar fluctuation in total disease rates. The pattern has been one of alternate high and low years, except for 1955 when an expected epidemic did not develop.

The importance of geographical variation has been so heavily stressed that it might be thought that within a country such as the United Kingdom, regional differences would be worth studying. The command structure is such that only two regions, Scottish Command and Northern Ireland District were reasonably distinct for our purposes. The other commands were Northern, with headquarters at York, Western with headquarters at Chester, Eastern with headquarters at Hounslow and including the London area, and Southern with headquarters at Salisbury and including the Aldershot district. The difficulties arise from the mobility of troops in training, who may be located in one command while on the ration strength of another, and also from the specialist nature of some hospitals which attract patients from far and wide: this is of course a familiar and the most intractable problem of civilian hospital statistics. There is one saving possibility in the Army set-up as regards the minor forms of illness, which were likely to be dealt with locally. For instance, respiratory conditions were mainly treated in medical reception stations (where the average length of treatment was 6 days as compared with 25 days for hospitals). Therefore, if we confine ourselves to the widespread and less serious disease groups, we may hope to obtain comparable

figures for the regions. As a basis we have used the number of injuries, the majority of which are not serious, and which there is no obvious reason to suppose should vary according to locality; such differences as do appear might be expected to reflect constant factors due to such administrative idiosyncracies as are mentioned above. On this basis of an annual rate of some 40 per 1,000 strength, we can erect a superstructure of other diseases as percentages in each area of the injury rate for the area. The result, in 1955 for instance, is to show, among the respiratory conditions, that tonsillitis and pharyngitis and bronchitis were comparatively steady as between regions, and that the greatest variation (relative to its numbers) occurred in cases of influenza, which were exceptionally numerous in Western Command, and were few in the North generally.

Other disease groups examined by the same method, which showed no exceptional variation between regions, were skin conditions, otitis externa and media, and the intestinal diseases.

Intestinal Diseases.—These have been of greatest concern in the Middle East (see Table II) where they dominated the medical scene from May till October, precisely the reverse of the United Kingdom with its ailments in winter, and its slackest month in August. (Germany had a more moderate winter peak, and also a rise at the end of the summer which might be ascribed to field training, when the intestinal diseases would be particularly prone to an increase).

The intestinal group is made up as follows:

Intestinal Diseases	*International List No.*
Enteric Fever	040–041
Amoebiasis	046
Dysentery, other than Amoebic ..	045, 047–048
Diarrhoea, Enteritis, etc.	785·6, 571–572, 042, 049
Infective Hepatitis	092

The largest and yet the mildest group was the somewhat amorphous one of "diarrhoea, etc." requiring an average treatment of about a week. A detailed examination of in-patient records shows that the great majority in the United Kingdom were diagnosed as gastro-enteritis and colitis, fairly evenly spread throughout the year, while in the Middle East this category was in a minority. The diarrhoea group may well include unidentified cases of dysentery. Bacillary dysentery was the other main or more specific contributor to intestinal disease in the Middle East, whereas amoebiasis was negligible, appearing rather in the Far East. The importance of the latter lay in its prolonged treatment of 5 or 6 weeks, as compared with 11 or 12 days for bacillary dysentery. Only a small proportion are recorded according to type, but among these it may be of interest to show the difference between countries in respect of Sonne dysentery and the Flexner-Boyd group. The following types were identified in 1953:

Command	Dysentery	
	Sonne	Flexner-Boyd
UK	17	3
MELF	43	116
FARELF	5	56

Sonne dysentery which is relatively important in the United Kingdom, takes a secondary place in the Middle East and is of relatively little importance in the Far East. The only other large group to be typed was Shiga dysentery (with seventeen cases in the Middle East and five in the Far East).

The United Kingdom cases of Sonne dysentery are too few to challenge the experience from civilian notifications of a maximum in March, but in the Middle East all forms of dysentery seem to increase in the summer. In this particular year Sonne dysentery had its maximum incidence in September, after an earlier outbreak in June; the Flexner-Boyd group was similar, but the unspecified forms of bacillary dysentery, which were about five times as large, had the June peak alone.

It may have been wrong to place infective hepatitis with this group, but at least it is clear from the admission rates that the disease is more common in the tropics than the temperate zones, and the same preventive sanitary measures are relied on to control it. A most interesting feature is that its seasonal occurrence lags behind that of the diarrhoea group

in the Middle East and is high between September and January (Fig. 3).

We have kept to the end of this section on intestinal diseases the discussion on enteric fever, now fortunately of minor importance after its former pre-eminence, partly through treatment by chloramphenicol, but much more so by a reduction in incidence. It is the only one of the intestinal group against which protection is sought by the universal use of a vaccine, and possibly it is this which at times has brought it within bounds while the other intestinal diseases remained rampant. At any rate, by 1951, it had reached a record low post-war level in the Middle East (there were too few cases elsewhere to be worth discussing). But now the position altered remarkably. The cases to date had been mainly typhoid, but in 1952 there was an outbreak in September, which brought the annual rate to about 4 per 1,000, and proved to be paratyphoid B. Similar outbreaks occurred in subsequent years, and only began to decrease in 1955 when the evacuation of the Suez Canal Zone began.

The Middle East command has been particularly liable to changes in the location of troops, which can have the effect of greatly increasing the variation in disease rates. It is an enormous and heterogeneous area, at one time including East Africa and Mauritius, which were, however, separated off in 1953. Malta was also separated at the end of that year, and in 1955 the Sudan was evacuated; few troops had indeed been stationed in the Sudan, but they had a particularly high sickness rate. The sick rate of the whole command was largely determined until 1955 by the troops in the Canal Zone, where the rate was generally lower than elsewhere. When the Suez evacuation was completed in 1956, Cyprus grew correspondingly in importance, as headquarters of the command.

No other command had the composition of its forces shifted around to the same extent during this period. Troops were withdrawn from Trieste in 1954, and from Austria in 1955, but these do not come under discussion as they were never in BAOR. The only other change to affect this survey was the inclusion in FARELF, half-way through 1956, of the troops that remained in Korea.

Malaria.—This is mainly a problem in the Far and Middle East. Elsewhere in the world where British troops have been stationed recently, the only

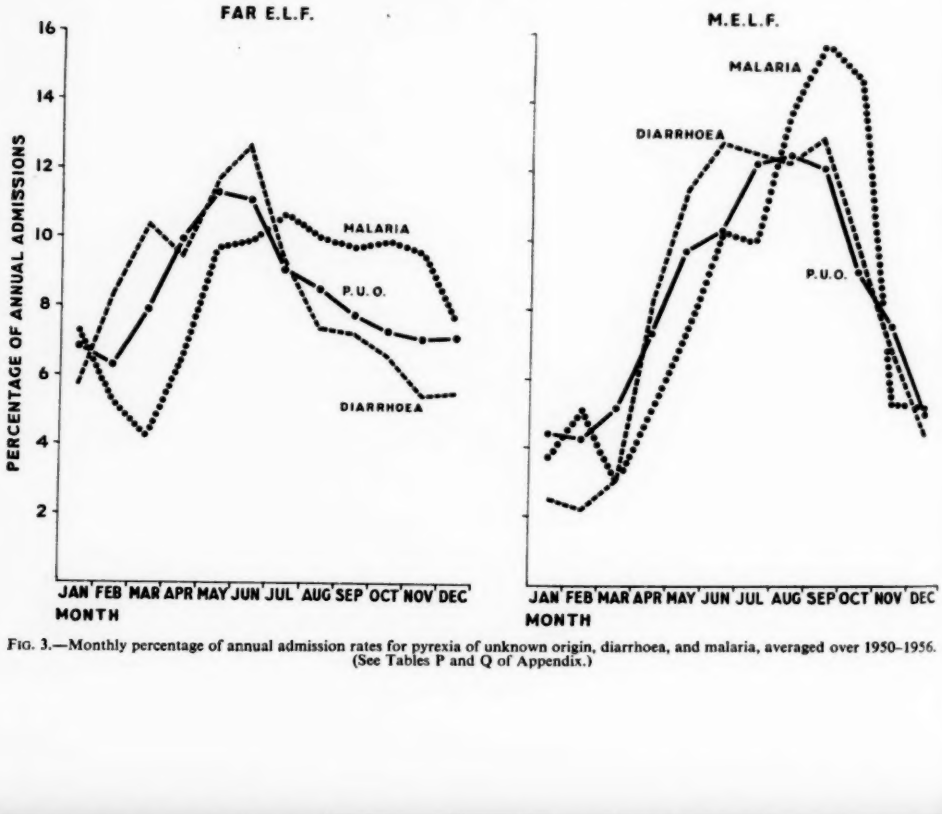

FIG. 3.—Monthly percentage of annual admission rates for pyrexia of unknown origin, diarrhoea, and malaria, averaged over 1950–1956. (See Tables P and Q of Appendix.)

place with higher rates has been West Africa (which otherwise has become surprisingly healthy when compared with former standards).

The malaria position in the Far East has been improving ever since it was brought under control towards the end of the second world war. In the period under review, paludrine (proguanil) was used as a prophylactic. That it did not eradicate malaria completely is evident from the cases occurring in the United Kingdom among returning soldiers; some also were found among Reservists called up for annual training. In certain years, for instance 1952 and 1953, as many cases were being discovered in the United Kingdom as in the Far East. (The numbers truly "at risk" of course were far from being the strength of the United Kingdom.) The relapses were almost all cases of the benign tertian variety (B.T.), and in the Far East these comprised two-thirds of the cases, the remainder being accounted of the malignant tertian variety (M.T.). This is presumably because of the fact, known from the action of the drug, that paludrine is a true causal prophylactic for M.T. malaria, but merely suppresses B.T. malaria. In contrast to the Far East, the malaria in West Africa was largely of the malignant tertian variety.

Pyrexia of Unknown Origin (P.U.O.).—This is the residue of the once enormous fever group that has been progressively reduced as the discovery of particular organisms, carriers, or modes of transmission, have enabled distinctive labels to be given to fevers of various kinds. Many of those remaining must be merely mild, and therefore clinically unrecognized, cases of known diseases, which perhaps do not justify a detailed laboratory investigation to establish their origin. In recent times leptospirosis and scrub typhus have been suggested as accounting for some of the cases, but it seems at present that no single cause is going to allow for the dramatic renaming of the whole group, and that a variety of agents contribute to it. It is worth adding a remark about the seasonal distribution, since that can be looked for to provide an epidemiological clue. In the Far East, averaged over the years, the peak period for P.U.O. appeared to be in the early summer—roughly the same distribution indeed as the diarrhoea group, whereas malaria had a much later maximum. In the Middle East, P.U.O. is at its highest later in the summer, about the same time also as the intestinal group (Fig. 3).

Appendicitis and Peptic Ulceration.—The Morbidity Tables in the Appendix, which give fuller details of the diseases that have been discussed above in outline, also cover a few conditions such as appendicitis which are of comparatively small importance individually, and are not, as are the infections, potential sources of epidemics. They nevertheless take their regular toll among young soldiers.

Details obtained from in-patient records show that the great majority of appendicitis cases were acute, but an interesting feature of the remainder, including those of chronic appendicitis, was that they contain a higher proportion of officers, even at comparable ages. In acute appendicitis there was no apparent distinction between officers and other ranks, both having a reduced incidence with advancing age. As to appendicectomies, 3,256 were performed in the United Kingdom in the 3 years from 1952 to 1954, out of 3,960 cases (82 per cent.).

The cases of appendicitis which were reported on the monthly returns exceeded by a quarter those for which in-patient records were eventually received, and although a similar position holds for other diseases, this may be invoked to explain the following diagnostic conundrum. It was noted in the Report on the Health of the Army for 1951 and 1952 (1954) that a correlation in time appeared to exist between appendicitis and peptic ulcers (actually duodenal ulcers) since 1945, both having increased while the general tendency in other diseases, was to a decrease. (This correlation is not apparent from the Appendix Tables, as it depends more on the earlier post-war years.) The suggestion was that an ill-determined pain might be given a provisional diagnosis, indiscriminately between the two, and might clear up without confirmation. An aid to this might certainly be the age of the patient, for peptic ulceration is not a disease of young soldiers as is appendicitis.

The Influence of Age

Although it was established at the beginning that age was of little account in examining time trends of morbidity among young soldiers, and was much less important than a geographical distinction, this is not to deny that age constitutes one of the prime factors in the epidemiology of the subject. Already we have had to refer once or twice to situations where the young soldier has a very different sickness experience from the rest of the Army, and sometimes this is so marked that it is noticeable even within the very small range covering the ages that we mean by the term young soldier (*i.e.* the National Service range, which is certainly under 30 years).

The remainder of this review is based on analyses of in-patient records which give more detail than the monthly returns, but for various reasons add up to

smaller totals, and therefore should not be compared directly with the rates already quoted. They may be relied on rather as local indices, giving a trustworthy comparison within their own sphere, for example, between age groups.

In the United Kingdom the highest admission rates were undoubtedly in the youngest age group, reflecting the position with respiratory diseases and others. If we take the standard 5-year age groups, the youngest (up to 19 years on his last birthday, *i.e.* less than 20 years old) is in reality a two-year group only, with few under the age of 18. The four groups over the age of 30 are not within the definition of a young soldier but may indicate occasionally the ultimate drift. Overseas the youngest group of all did not always have the highest sickness experience. This is exaggerated by venereal diseases which reach a peak in the twenties, but there remains a slight difference without them, as shown in Fig. 4, which also indicates the rapid falling off in rates after the age of 30.

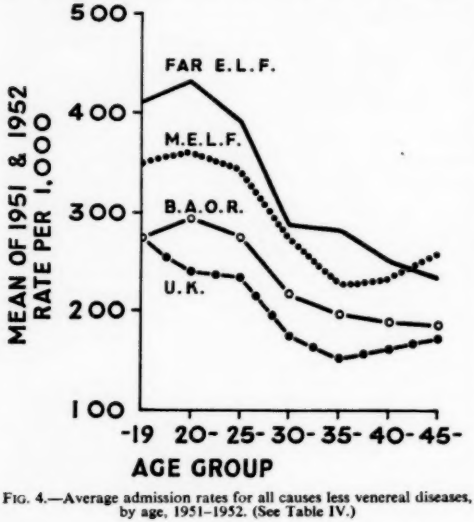

FIG. 4.—Average admission rates for all causes less venereal diseases, by age, 1951–1952. (See Table IV.)

Fig. 4 is based on Table IV, which relates to 1951–1952.

TABLE IV

ADMISSIONS FOR ALL CAUSES LESS VENEREAL DISEASES AVERAGE RATES FOR 1951–1952 PER 1,000 STRENGTH, BY AGE LAST BIRTHDAY

Age (yrs)	-19	20–24	25–29	30–34	35–39	40–44	45–
UK	272	244	238	176	151	160	172
BAOR ..	270	295	278	216	195	186	185
MELF ..	349	355	338	277	228	232	260
FARELF ..	414	432	396	295	285	256	231

In spite of the marked age contrast, the previous discussions on the basis of total rates remain valid owing to the preponderance in strength at the younger ages.

The unexpectedly lower rate of the youngest group overseas may have been partly due to their more recent embarkation, considered as a group, having passed a fitness test on leaving the United Kingdom. To heighten the contrast, the youngest group in the United Kingdom would have the greatest share of recruits suffering from the newly-encountered hazards of military life. One fairly obvious contribution would come from the effects of being inoculated: this is reflected in the injury figures, and together with the large number of injuries sustained during sport for all young soldiers explains the similar and even sharper contrast with the older soldiers than is evident in the Table of admissions for all causes. (See Appendix Table R which shows admissions for injuries and certain diseases by age.) The presence of recruits in the United Kingdom during their first months of service tends to weight the youngest age group of all, so that it is centred at a rather lower age than overseas.

The infectious diseases of childhood naturally diminished with age in the combing out of the last few who were not immune; rubella, for instance, claimed no victims after the age of 30. But similar steep trends (not however leading to complete disappearance) were evident with the acute respiratory conditions and skin diseases. With these (Fig. 5, opposite), the age effect was powerful enough to overcome any such tendency as that noted above in all causes for the very youngest group overseas to have a slightly lower rate; in any case, being fit enough to go overseas would be no guarantee against getting tonsillitis or tinea or a great number of other complaints.

It would appear from the graph of the respiratory conditions, that the excess in the United Kingdom is greater in the younger age groups. As noted above, the excess can be accounted for most aptly by influenza and the common cold. The skin conditions in Fig. 5 tell a similar story in regard to the Far East, and here it is tinea that accounts for the excess most satisfactorily. A recent arrival in the Far East corresponds possibly to a recruit in the United Kingdom, and the former in spite of physical fitness was susceptible to new kinds of infection. Actually tinea does not get a hold until the third or fourth month, as seen from Table V (opposite).

(The next section includes a discussion of rounding-up errors in length of service, which applies here too.)

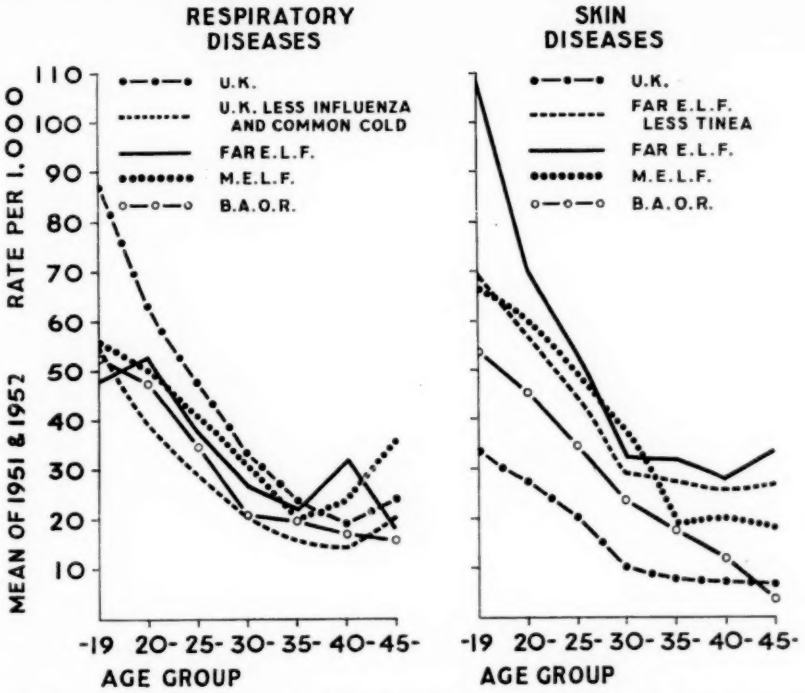

FIG. 5.—Average admission rates for respiratory diseases and skin diseases, by age, 1951–1952. (See Table R of Appendix.)

TABLE V

ADMISSIONS FOR SKIN DISEASES, FARELF 1954, AMONG NATIONAL SERVICEMEN, BY MONTHS SINCE ARRIVAL IN THEATRE, FOR FIRST 6 MONTHS

Completed Months in Theatre	Tinea	Other Skin Diseases
0	4	33
1	7	50
2	22	41
3	44	61
4	49	47
5	29	51

Some types of risk were only indirectly related to age, such as the risk of malaria, which was greatest in the areas where mosquitoes were not under control, that is the areas of active patrolling. The members of the patrols would very likely consist of young soldiers, but would include only those who had had an initial period of acclimatization and training after arrival in the theatre. This factor may have been at work in some components at least of P.U.O., which we last spoke of as having, in the Middle East, a seasonal picture like that of the intestinal diseases. Fig. 6 (overleaf) shows that there is an age difference in respect of the youngest group, who seemed to be particularly liable to attacks of diarrhoea and dysentery (and incidentally also of enteric fever) on arrival in the Middle East, but who suffered less excessively from P.U.O.

Table VI shows how immediate was the onset of diarrhoea on arrival in the Middle East. (Again some correction may be needed for rounding-up errors.)

TABLE VI

ADMISSIONS FOR DIARRHOEA AND ENTERITIS, MELF AMONG NATIONAL SERVICEMEN, BY MONTHS SINCE ARRIVAL IN THEATRE, FOR FIRST 6 MONTHS

Completed Months in Theatre	Diarrhoea and Enteritis
0	86
1	87
2	77
3	57
4	60
5	46

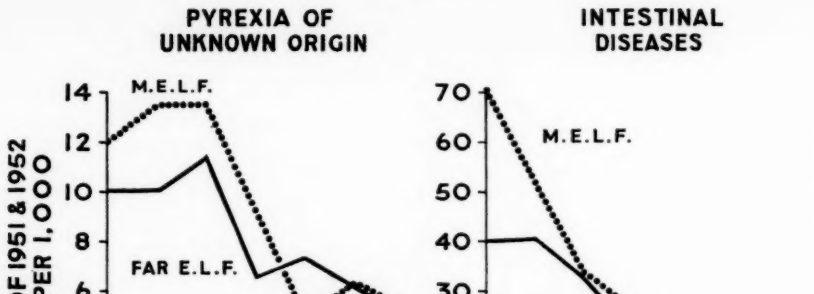

FIG. 6.—Average admission rates for pyrexia of unknown origin and intestinal diseases, by age, 1951–1952. (See Table R of Appendix.)

The seasonal occurrence of infective hepatitis, which was provisionally included in the intestinal group, was found to lag a few months after the rest of the group in the Middle East. The age of maximum incidence was the early twenties, not the under twenties as with diarrhoea and dysentery, and there is therefore a suggestion that a time delay exists, while the infective organism is being harboured before the appearance of clinical signs.

LENGTH OF SERVICE

Age and service are the warp and weft of disease in the Army, and it will become plain in the sequel that among National Servicemen the weft has created the pattern of the material, as in a tapestry pattern.

A consideration of the different lengths of service of cases admitted reveals a spectacular concentration in the early months of service, among those treated in the United Kingdom. Table VII shows the relative percentages in 1952, as stated by the patient. A closer investigation of periods such as "a month's service" proves that this is liable to rounding-up errors. A detailed investigation was made of a sample of respiratory conditions, which bulked largely in these admissions. The proportion of corrected statements might conceivably vary in a particular disease with an unusual service distribution, but for the present purpose the correction is adequate, and puts the percentage in the first month up to 17 per cent. with compensating corrections subsequently. Injuries have been omitted from Table VII in order to exclude the effects of inoculation, which would have emphasized the early months even more.

TABLE VII

PERCENTAGE NATIONAL SERVICEMEN ADMITTED TO MEDICAL UNITS IN THE UK, ALL DISEASES, 1952, BY COMPLETED MONTHS OF SERVICE

Completed Months of Service	As Stated by Patient	
0	10·4 per cent. (corrected to 17 per cent. for rounding-up errors)	100
1	13·3	
2	9·5	
3	8·5	
4	6·6	
5	5·3	
6–8 (3-mth average)	4·6	
9–11 (3-mth average)	2·4	
12–17 (6-mth average)	2·0	
18–23 (6-mth average)	2·2	

The apparent effect of length of service is exaggerated in Table VII, since the numbers at risk in the United Kingdom diminished after about 4 months owing to service overseas; by the second year, half would be overseas. (A global analysis would not help greatly as the disease risk varies so much from that experienced in the United Kingdom.) Even so, the general trend can be

demonstrated with a stabilized rate after about the ninth month and throughout the second year; the initial rate of sickness is certainly three times as great as that in the later period.

As to the cause, the subjection to a strange environment and exposure to infection would seem sufficient; much of the trend can certainly be ascribed to respiratory conditions. Another factor may be the admission of some patients to hospital before discharge from the Army on medical grounds which were only discovered at the call-up examination (many such rejections, however, would be treated as out-patients).

Although there is really no gainsaying the first 3 months' experience, when the recruit is receiving his primary training, the question arises whether the apparent effect of service is a mere by-product of increasing age, or whether the converse is true, that an apparent improvement with age is merely a reflection of long service. The two are difficult to disentangle, since generally speaking the older soldier has the longer service. So far we have as it were looked at the edges of the penny (a straight line from any direction) but not down on its face.

The problem was insoluble for a long while, for although each in-patient record could provide the information about both age and service, the numbers at risk for every combination of values of age and service were not known. This problem was eventually solved by obtaining a random sample of the Army which gave the required information. The cases could then be related to an appropriate number at risk, scaled up to a correct total for the actual size of the Army. The error in each rate so calculated is larger than that usually assumed in evaluating morbidity rates because the denominator is in fact based on a small sample; standard errors have therefore been calculated to take account of the extra uncertainty thus introduced, and are quoted in the tables. Table VIII, for example, gives the rates for all diseases in the United Kingdom in 1954. (The numbers at risk are strictly appropriate to 1955, when the sample was actually taken.)

Owing to the small numbers with a year's service who were yet under 19 years of age, these have been grouped with those over 19. There were also few aged 19 with less than 3 months' service (deferment being usually for 2 years), and these have been grouped with those over 20 years old. Admittedly the groups do not fall neatly into the cells allotted in the Table, and this leads to some surprising results. The reason is that cells in a particular column have different centres of gravity. For example in the last column, showing those in their second year of service; the average service for those aged 19 was 1 year 4 months, while for those aged 20 and over it was 1 year 7½ months. Similarly, for those in their first year of service, after the primary recruit stage (*i.e.* the centre column), the average service for those below the age of 19 was 5 months, for those aged 19 it was 8½ months, and for those aged 20 and over it was 7½ months. From the point of view of age, that is to say the rows of the Table, there is little in it; the recent recruits aged 20 and over have an average age of 21, and the remainder an average age of 22.

Although it is possible to compare pairs of these rates in the ordinary way, an overall test is very revealing, as a first step, and we find the following significant departures from the average:

The rate for those aged 20 and over in their second year of service is significantly low, and the rates for those under the age of 19 (both recent recruits and others still in their first year of service) are significantly high. (The recent recruits aged 20 and over are fewer than those aged 18, and the rate is therefore less easily demonstrated as significant.) There is agreement here with the conclusion already reached tentatively that the first months have an exceptionally high rate, particularly if we remember that the average service in the top cell of the centre column is only 5 months compared with 8 months lower down. Now, however, the effect is seen in relation to age, and estimates of the rates are provided in detail at various age and service intersections. It can be seen how the age taken by itself will provide a marginal picture of steadily decreasing rates; the averages of Table VIII weighted according to the numbers at risk are as follows:

TABLE VIII

ALL DISEASES AMONG NATIONAL SERVICEMEN IN U.K., 1954

Rates per 1,000, by age and length of service

Age Last Birthday (yrs)	Length of Service (completed months)		
	0–	3–	12–
Up to 18	*290 ± 45	*313 ± 52	—
19	—	134 ± 21	198 ± 28
20 and Over	268 ± 55	173 ± 27	*98 ± 10

* Rates which depart significantly from the average in an overall test.

Age (yrs)	Rate per 1,000
Up to 18	297
19	176
20 and Over	127

In the same way the marginal rates for different lengths of service are:

Months of Service	Rate per 1,000
0–	278
3–	199
12–	133

Yet from Table VIII the true picture is more circumstantial. To start with we can only deduce the effect of long service for anyone aged 18, or initial service for anyone aged 19. However, the latter point is easily acceptable, because both younger and older National Servicemen have a high rate in the first 3 months. As for longer periods of service, the evidence for the second year having a lower rate is confined to those aged 20 and over. The difference for those aged 19 is not significant, and it is noteworthy that the interval in this case is only $7\frac{1}{2}$ months as compared with a year for the older group.

From the other point of view, looking for an effect of age at equivalent lengths of service, we must make some allowance for the differing centres of gravity already discussed, but even so there seems to be a higher sickness rate for those aged 18 in their first year of service (after primary training), and for those aged 19 in the second year, that is to say a true effect of age making for greater liability to sickness in the younger recruit, while in the first three months of service there is no detectable trend for age. The phrase "true effect of age" is still not an irreducible biological finding, since it is confounded with the deferred status of the older recruits, so that the latter may come from a healthier section of the population (they have been shown (Rosenbaum, 1954) to differ in physique). The expectation with a later call-up for everyone would be that a slightly lower sickness rate would result from the entry of fewer who were still not immune to the adolescent infections, but that the same pattern would remain of a distinction between the deferred and other National Serviceman.

A similar story can be told with regard to individual diseases, but these are more appropriately dealt with in special studies; for example, respiratory diseases whose major contribution to the pattern was mentioned earlier. One important group may be put forward here as a specimen, namely skin conditions, which are given in Table IX in the same form as for all diseases.

TABLE IX

SKIN CONDITIONS AMONG NATIONAL SERVICEMEN IN U.K., 1954

Rates per 1,000, by age and length of service

Age Last Birthday (yrs)	Length of Service (completed months)		
	0–	3–	12–
Up to 18	$33{\cdot}0 \pm 5{\cdot}3$	*$43{\cdot}0 \pm 7{\cdot}3$	—
19	—	$20{\cdot}1 \pm 3{\cdot}3$	$29{\cdot}8 \pm 4{\cdot}3$
20 and Over	$34{\cdot}7 \pm 7{\cdot}3$	$21{\cdot}1 \pm 3{\cdot}5$	*$13{\cdot}1 \pm 1{\cdot}5$

* Rates which depart significantly from the average in an overall test.

The same provisos apply to Table IX as to Table VIII, and the same deductions can be made with one exception. Tables VIII and IX are in fact practically proportional to one another throughout in the ratio $1 : 7\frac{1}{2}$, except that the high incidence among the young recruits is less pronounced for skin conditions than for diseases in general.

Having shown that length of service is of prime importance for the incidence of disease among National Servicemen, it is necessary to remark that the age span used as a contrast is a narrow one. Age differences of the order of 10 or 20 years are of course as important in the trained soldier as among civilians.

THE SOLDIER'S JOB

Occupation is a standard axis of classification in morbidity and mortality studies, and in national comparisons it is wisest perhaps to stick to a single appelative, and to describe the occupation of the National Serviceman as just "soldiering". This covers such a multitude of occupational risks that it is not easy to obtain clear facts on them severally. The classical approach in the Army has been to look for officer differences and for differences between Corps, but these are difficult to interpret. For instance officers are older on average than other ranks and can be expected to share the lower sickness rates of the older groups. (In a survey of National Servicemen, officers play a much smaller part, being a smaller fraction, than in the remainder of the Army. They are older than other National Servicemen, and it is likely that they enjoy the same sort of background advantage in respect of health that the deferred men do.) As to differences between Corps, this was once justified on the grounds of certain stations being unhealthy, together with long periods of sojourn in them. Now there is not the same degree of permanence, and hygiene practice is universal and thorough. This is reflected in the sameness of many disease rates as far as they have been examined

(excluding injuries) and there is usually ample explanation for crude (that is not standardized) differences in the different age structures and proportion of National Servicemen; occasionally no doubt there is an exception, as with the greater liability of the Royal Army Medical Corps before 1953 to contract cases of tuberculosis (a distinction once upon a time credited to the Guards, perhaps because of their barracks which were situated in London. This distinction no longer holds). The chief difficulty in making comparisons between Corps is that they do not start level in respect of their physical condition. For instance, the Infantry would accept only Grade I men, and Grade III men would be assigned to the few Corps which could make use of them, with their restricted liability to serve say on lines of communication or in the United Kingdom only. Such evidence as there is points to a higher sick rate for these Grade III men.

Injuries were excluded from the comments above, because there at least the Corps breakdown is a revealing one. Revealing, that is, in the sense of providing estimates, for there is nothing very unexpected about some of the results. Cooks tend to get scalded, and infantry to become battle casualties. But, with injuries as with diseases, a large proportion of the time at risk was spent on activities common to all soldiers, and under the same aegis of the Army Council, with its meticulous and almost grandmotherly concern for every detail of a soldier's existence, and its equitable distribution of the necessities of life and health.

The key factors of geography and of length of service were associated inevitably with a soldier's occupation. He was certain to do his primary training in the United Kingdom, and then stood an even chance of going abroad, perhaps to engage in advanced training and no more (BAOR), or to do jungle patrolling in Malaya and risk the tropical diseases, or even to fight in a formal war as in Korea. The accidents of contemporary history were superimposed on the more permanent features of climate, vectors, and the indigenous minusculae, to aggravate the consequences in terms of disease.

The great majority however were in non-operational roles, and particularly in the case of the young soldiers led a life which differed in well-known respects from the civilian norm. With inevitable exceptions, they lived in barracks or huts and slept in dormitories, ate in communal dining-rooms, spent a deal of time out of doors, were frequently inspected, and had their illnesses promptly attended to. In their first 3 months of service they were congregated in barracks with other recruits of a like junior status, but subsequently joined a Service unit with a cross-section of age and experience.

Mortality

We have covered in the discussion of separate disease and injury groups some half to two-thirds of all admissions to medical units. Serious as they are from the point of view of the Army health authorities they do not have the same immediate concern for the individual; they are not identical with the fatal diseases. Something should be said on this score, although the number concerned was small, being of the order of 1 per 1,000 per year, apart from deaths in action.

A comparison between theatres is of little use, since many seriously ill patients were evacuated to the United Kingdom and died there (determining the theatre where the disease originated is a difficult matter); in addition certain cases would have been detected before leaving for an overseas tour of duty, and the populations at risk overseas were selected groups from the point of view of fitness. (A similar consideration applies to morbidity, but here the effect is of far less importance except in a few instances, for example tuberculosis.) Deaths are therefore to be thought of in relation to the Army as a whole, with the one notable exception of deaths due to injury, which outnumbered those due to all the diseases put together. Death due to injury is exceptional in that the cause is usually immediately related to the sequel. The result is that three deaths from injury occurred overseas for every one at home, although the numbers at risk were about equal. (This allows for deaths due to enemy action. It should be noted that the deaths due to enemy action shown in Table M of the Appendix, only include those which occurred in a medical unit and cases in which a body was brought in already dead. Other cases of death in action are not included.)

The more important of the diseases causing death are listed in Appendix Table M; the inclusion of older men is less justified in an appraisal of young soldiers. Movements in time are none the less reflected well enough, and the tremendous reduction in deaths from tuberculosis is shown to have begun in 1949, to 1950. The fall appeared to be far steeper than among civilians, which might have been partly due to the policy of discharging patients to civilian sanatoria before the disease had taken its full course.

Summary

A review has been made of the health of young soldiers over a 7-year period, from 1950 to 1956, when the conditions of National Service and the structure of the Army were fairly stable. It is pointed out that National Service covered the fittest 80 per cent. of the young male population of the country (the Army took over two-thirds of them), and that the consequences of soldiering were therefore important to the health of the nation.

Geographical and climatic differences in the places where they served were found to have greater influence on their health during the period studied than differences from year to year, although decided improvements were recorded between the beginning and end of the 7 years under review.

Certain diseases could always be associated with particular theatres, such as intestinal diseases in the Middle East, skin diseases in the Far East, and respiratory diseases in the United Kingdom.

Age was a subordinate factor in the United Kingdom in determining morbidity, which was shaped largely by length of service, the recruit stage being particularly vulnerable in respect of respiratory conditions. A similar factor came into play on being exposed to another new environment after arrival in the tropical commands.

Such advantage as there appeared to be in a later call-up was probably due in the main to the healthier home background of those whose service had been deferred.

REFERENCES

Mackay, D. (1951). "Hospital Morbidity Statistics", G.R.O. Studies on Medical and Population Subjects, No. 4. H.M.S.O., London.

Report on the Health of the Army for 1951 and 1952 (1954). By command of the Army Council. (W.O. Code No. 11055).

Report on the Health of the Army for 1954 (1958). By command of the Army Council. (W.O. Code No. 11709).

Rosenbaum, S. (1954). *J. roy. statist. Soc.*, Series A, **117**, 331.

APPENDIX TABLES

Appendix Table A

ADMISSIONS OF BRITISH ARMY MALES IN MAIN COMMANDS, 1950–1956
RATES PER 1,000 STRENGTH, ALL DISEASES

Command	1950	1951	1952	1953	1954	1955	1956	Average	Range
UK	275·7	281·8	274·2	303·0	251·3	226·9	213·4	260·9	89·6
BAOR	309·7	300·9	227·6	240·6	214·2	217·4	175·8	240·9	133·9
MELF	420·4	402·8	357·5	333·0	254·5	263·2	271·2	328·9	165·9
FARELF	614·4	568·8	459·1	416·5	418·7	338·8	387·1	457·6	275·6
Range	338·7	287·0	231·5	175·9	204·5	121·4	211·2		

Appendix Table B

ADMISSIONS OF BRITISH ARMY MALES IN MAIN COMMANDS, 1950–1956
RATES PER 1,000 STRENGTH ALL INJURIES

Command	1950	1951	1952	1953	1954	1955	1956	Average	Range
UK	34·7	32·6	32·6	34·7	34·8	37·9	42·6	35·7	10·0
BAOR	61·1	59·2	52·8	55·1	53·1	58·5	55·7	56·5	8·3
MELF	40·3	40·4	41·1	38·8	29·6	34·7	56·1	40·1	26·5
FARELF	59·5	54·2	51·2	57·0	50·9	48·6	55·8	53·9	10·9
Range	26·4	26·6	20·2	22·3	23·5	23·8	13·5		

Appendix Table C

ADMISSIONS OF BRITISH ARMY MALES IN MAIN COMMANDS, 1950–1956
RATES PER 1,000 STRENGTH, RESPIRATORY DISEASES

Int. List No.	Disease	Command	1950	1951	1952	1953	1954	1955	1956	Average	Range
472–473	Tonsillitis and Pharyngitis	UK	41·2	36·8	40·1	45·7	35·6	32·9	30·4	37·5	15·3
		BAOR	30·3	32·5	21·4	28·1	25·4	22·5	14·5	25·0	18·0
		MELF	42·8	48·2	38·6	36·1	24·0	25·1	28·7	34·8	24·2
		FARELF	24·1	26·0	22·1	24·8	24·7	19·6	20·4	23·1	6·4
		Range	18·7	22·2	18·7	20·9	11·6	13·3	15·9		
470	Common Cold	UK	22·8	19·9	21·3	29·8	26·7	24·9	21·1	23·8	9·9
		BAOR	6·9	11·9	5·6	6·9	6·9	5·2	4·7	6·9	7·2
		MELF	3·6	4·3	3·2	2·2	1·1	1·6	2·2	2·6	3·2
		FARELF	11·1	14·2	9·6	6·1	5·7	2·4	3·3	7·5	11·8
		Range	19·2	15·6	18·1	27·6	25·6	23·3	18·9		
480–483	Influenza	UK	12·0	23·0	10·6	24·3	11·3	8·9	8·7	14·1	15·6
		BAOR	4·0	6·1	4·8	15·6	5·5	13·7	4·5	7·7	11·6
		MELF	2·8	2·9	1·4	1·0	0·4	0·5	1·6	1·5	2·5
		FARELF	4·1	1·8	0·9	0·5	1·0	1·1	3·2	1·8	3·6
		Range	9·2	21·2	9·7	23·8	10·9	13·2	7·1		
500–502	Bronchitis	UK	7·7	8·8	8·8	9·3	8·4	7·0	7·7	8·2	2·3
		BAOR	4·7	4·2	3·9	6·2	4·3	3·5	3·5	4·3	2·7
		MELF	5·3	5·8	6·2	4·4	3·2	3·2	4·1	4·6	3·0
		FARELF	11·0	8·7	8·4	7·7	7·5	4·4	6·3	7·7	6·6
		Range	6·3	4·6	4·9	4·9	5·2	3·8	4·2		
490–493	Pneumonia	UK	3·6	3·8	4·3	4·2	3·8	3·5	3·3	3·8	1·0
		BAOR	2·0	1·8	1·6	3·1	2·9	3·1	2·0	2·4	1·5
		MELF	4·0	3·2	2·6	1·9	1·5	2·9	3·1	2·7	2·5
		FARELF	1·7	2·2	1·8	2·4	1·6	2·5	2·5	2·1	0·9
		Range	2·3	2·0	2·7	2·3	2·3	1·0	1·3		
—	All Respiratory Diseases	UK	87·3	92·3	85·1	113·3	85·8	77·2	71·2	87·5	42·1
		BAOR	47·9	56·5	37·3	59·9	45·0	48·0	29·2	46·3	30·7
		MELF	58·5	64·4	52·0	45·6	30·2	33·3	39·7	46·2	34·2
		FARELF	52·0	52·9	42·8	41·5	40·5	30·0	35·7	42·2	22·9
		Range	39·4	39·4	47·8	71·8	55·6	47·2	42·0		

Appendix Table D

ADMISSIONS OF BRITISH ARMY MALES IN MAIN COMMANDS, 1950–1956
RATES PER 1,000 STRENGTH, OTITIS

Int. List No.	Disease	Command	1950	1951	1952	1953	1954	1955	1956	Average	Range
390	Otitis Externa	UK	No figures available		1·9	1·5	1·3	1·1	1·1	1·4	0·8
		BAOR			1·3	2·1	1·5	1·2	1·3	1·5	0·9
		MELF			7·5	5·4	2·4	3·2	3·5	4·4	5·1
		FARELF			9·0	9·0	8·9	7·2	6·9	8·2	2·1
		Range			7·7	7·5	7·6	6·1	5·8		
391–392	Otitis Media	UK	No figures available		4·3	4·0	3·5	2·9	2·8	3·5	1·5
		BAOR			3·7	4·3	2·7	2·5	2·3	3·1	2·0
		MELF			6·5	5·1	2·7	3·6	3·4	4·3	3·8
		FARELF			5·3	4·2	9·4	4·8	3·7	5·5	5·7
		Range			2·8	1·1	6·7	2·3	1·4		
390–392	Otitis Externa and Media	UK	4·2	4·9	6·1	5·5	4·8	3·9	4·0	4·8	2·2
		BAOR	7·3	5·3	5·1	6·4	4·2	3·7	3·6	5·1	3·7
		MELF	12·6	13·7	14·0	10·5	5·1	6·8	6·9	9·9	8·9
		FARELF	21·5	19·1	14·4	13·2	18·2	12·0	10·6	15·6	10·9
		Range	17·3	14·2	9·3	7·7	14·0	8·3	7·0		

Appendix Table E

ADMISSIONS OF BRITISH ARMY MALES IN MAIN COMMANDS, 1950–1956
RATES PER 1,000 STRENGTH, SKIN CONDITIONS

Int. List No.	Disease	Command	1950	1951	1952	1953	1954	1955	1956	Average	Range
690–694 696–698	Boils, Carbuncles Cellulitis, and Other Septic Conditions ..	UK	32·0	24·8	23·4	20·9	16·7	14·3	12·1	20·6	19·9
		BAOR ..	31·7	30·5	18·0	19·4	20·1	19·3	13·5	21·8	18·3
		MELF	53·4	52·5	40·8	28·1	16·5	12·3	22·0	32·2	41·1
		FARELF ..	48·6	40·5	35·4	27·9	22·0	17·3	27·2	31·3	31·3
		Range	21·7	27·7	22·8	8·7	5·5	7·0	15·1		
695	Impetigo ..	UK	2·5	2·3	2·9	3·0	3·3	3·2	1·6	2·7	1·7
		BAOR ..	4·2	3·8	4·1	4·2	4·8	3·7	1·6	3·8	3·2
		MELF	3·9	4·8	3·9	2·9	2·0	3·0	1·4	3·1	3·4
		FARELF ..	8·3	5·0	3·4	6·2	6·0	4·3	4·1	5·3	4·9
		Range	5·8	2·7	1·2	3·3	4·0	1·3	2·7		
Part of 714·0	Prickly Heat ..	UK	0·2	0·0	0·2	0·0	0·0	0·0	0·0	0·1	0·2
		BAOR ..	0·1	0·1	—	0·0	0·0	0·0	0·0	0·0	0·1
		MELF	0·5	0·3	0·3	0·2	0·1	0·4	0·3	0·3	0·4
		FARELF ..	0·6	0·6	0·4	0·9	1·7	1·0	0·5	0·8	1·3
		Range	0·5	0·6	0·4	0·9	1·7	1·0	0·5		
135	Scabies ..	UK	0·5	0·3	0·3	0·4	0·2	0·5	0·4	0·4	0·3
		BAOR ..	0·6	0·7	0·3	0·4	0·4	0·4	0·3	0·4	0·4
		MELF	0·7	0·2	0·2	0·1	0·0	0·1	0·3	0·2	0·7
		FARELF ..	0·4	0·3	0·2	0·4	0·1	0·3	0·1	0·3	0·3
		Range	0·3	0·5	0·1	0·3	0·4	0·4	0·3		
131	Tinea Pedis ..	UK	0·5	0·5	0·4	0·4	0·3	0·4	0·6	0·4	0·3
		BAOR ..	0·7	0·3	0·6	0·4	0·7	1·3	0·9	0·7	1·0
		MELF	1·8	1·9	1·3	1·6	0·2	1·1	1·9	1·4	1·7
		FARELF ..	3·0	4·4	3·7	3·0	4·0	5·0	7·7	4·4	4·7
		Range	2·5	4·1	3·3	2·6	3·8	4·6	7·1		
131	Tinea Elsewhere	UK	0·2	0·2	0·4	0·4	0·2	0·4	0·4	0·3	0·2
		BAOR ..	0·5	0·2	0·3	0·1	0·4	1·3	1·2	0·6	1·2
		MELF	0·6	1·0	0·6	0·2	0·1	0·5	0·4	0·5	0·9
		FARELF ..	17·9	9·8	13·6	12·8	7·6	5·2	10·3	11·0	12·7
		Range	17·7	9·6	13·3	12·7	7·5	4·8	9·9		
052 Rest of 700-716	All Other Skin Diseases ..	UK	8·7	7·5	9·0	9·2	9·0	8·8	7·8	8·6	1·7
		BAOR ..	19·0	16·5	12·2	14·9	14·2	11·9	11·1	14·3	7·9
		MELF	18·7	17·6	15·7	11·4	7·9	11·1	14·0	13·8	10·8
		FARELF ..	36·5	27·0	19·6	18·9	17·1	17·0	12·1	21·2	24·4
		Range	27·8	19·5	10·6	9·7	9·2	8·2	6·2		
—	All Skin Conditions ..	UK	44·5	35·6	36·6	34·3	29·7	27·7	22·9	33·0	21·6
		BAOR ..	56·8	52·1	35·5	39·5	40·6	37·8	28·5	41·5	28·3
		MELF	79·5	78·3	62·8	44·5	26·7	28·5	40·3	51·5	52·8
		FARELF ..	115·3	87·6	76·3	69·9	58·6	50·1	61·8	74·2	65·2
		Range	70·8	52·0	40·8	35·6	31·9	22·4	38·9		

APPENDIX TABLE F

ADMISSIONS OF BRITISH ARMY MALES IN MAIN COMMANDS, 1950-1956
RATES PER 1,000 STRENGTH, VENEREAL DISEASES

Int. List No.	Disease	Command	1950	1951	1952	1953	1954	1955	1956	Average	Range
021	Early Syphilis..	UK	0·5	0·3	0·2	0·1	0·1	0·1	0·1	0·2	0·4
		BAOR	1·8	0·8	0·3	0·2	0·2	0·1	0·1	0·5	1·7
		MELF	2·8	1·2	0·3	0·4	0·1	0·2	0·1	0·7	2·7
		FARELF ..	6·5	3·1	2·8	1·0	0·5	1·6	0·5	2·3	6·0
		Range	6·0	2·8	2·6	0·9	0·4	1·5	0·4		
020 022–029	Other Syphilis	UK	0·1	0·1	0·2	0·1	0·0	0·1	0·1	0·1	0·2
		BAOR	0·2	0·1	0·2	0·5	0·0	0·0	0·3	0·2	0·5
		MELF	0·6	0·1	0·1	0·2	0·0	0·1	0·0	0·2	0·6
		FARELF ..	0·2	0·5	0·1	0·1	0·1	0·1	—	0·2	0·5
		Range	0·5	0·4	0·1	0·4	0·1	0·1	0·3		
030–035	Gonococcal Infection ..	UK	2·5	1·6	1·4	1·4	0·5	0·4	0·3	1·2	2·2
		BAOR	15·3	11·3	7·2	5·4	4·2	3·6	3·4	7·2	11·9
		MELF	8·7	7·5	4·1	2·8	3·9	2·3	4·0	4·8	6·4
		FARELF ..	60·4	64·9	40·5	30·1	31·7	33·7	28·9	41·5	36·0
		Range	57·9	63·3	39·1	28·7	31·2	33·3	28·6		
Part of 039	Non-gonococcal Urethritis ..	UK	2·0	2·3	2·4	2·2	1·3	1·3	1·2	1·8	1·2
		BAOR	5·7	3·4	6 2	5·3	3·3	3·5	3·2	4·4	3·0
		MELF	6·7	6·6	5·1	5·1	7·4	5·4	3·0	5·6	4·4
		FARELF ..	35·2	35·9	29·2	29·0	29·1	28·1	32·5	31·3	7·8
		Range	33·2	33·6	26·8	26·8	27·8	26·8	31·3		
036	Chancroid ..	UK	0·6	0·5	0·3	0·2	0·1	0·1	0·1	0·3	0·5
		BAOR	1·5	0·3	0·4	0·3	0·1	0·0	0·0	0·4	1·5
		MELF	5·7	3·0	0·9	0·8	0·9	0·7	0·2	1·7	5·5
		FARELF ..	23·7	25·0	6·9	5·8	6·1	3·2	5·4	10·9	21·8
		Range	23·1	24·7	6·6	5·6	6·0	3·2	5·4		
020–039	All Venereal Diseases ..	UK	7·3	6·1	5·5	5·4	2·6	2·5	2·3	4·5	5·0
		BAOR	26·9	17·3	15·3	12·8	7·8	8·3	8·3	13·8	19·1
		MELF	30·9	21·1	13·4	11·7	15·6	11·3	8·6	16·1	22·3
		FARELF ..	141·2	144·3	97·6	73·0	73·9	73·2	79·2	97·5	71·3
		Range	133·9	138·2	92·1	67·6	71·3	70·7	76·9		

Appendix Table G

ADMISSIONS OF BRITISH ARMY MALES IN MAIN COMMANDS, 1950–1956
RATES PER 1,000 STRENGTH, INTESTINAL DISEASES

Int. List No.	Disease	Command	1950	1951	1952	1953	1954	1955	1956	Average	Range
Part of 040	Typhoid	UK	0·0	—	—	0·0	—	—	0·0	0·0	0·0
		BAOR	—	—	0·0	—	—	—	—	0·0	0·0
		MELF	1·0	0·1	0·2	0·2	0·1	0·2	—	0·3	1·0
		FARELF	0·2	0·1	0·0	0·2	0·2	0·1	—	0·1	0·2
		Range	1·0	0·1	0·2	0·2	0·2	0·2	0·0		
041	Paratyphoid	UK	—	0·0	—	—	0·0	0·0	0·0	0·0	0·0
		BAOR	—	—	—	—	—	—	—	—	—
		MELF	0·7	0·2	3·4	3·6	3·9	1·0	0·1	1·8	3·8
		FARELF	0·1	0·1	0·0	0·0	0·1	—	0·0	0·0	0·1
		Range	0·7	0·2	3·4	3·6	3·9	1·0	0·1		
040 041	Total Enteric Fever	UK	0·0	0·0	—	0·0	0·0	0·0	0·0	0·0	0·0
		BAOR	—	—	0·0	—	—	0·0	—	0·0	0·0
		MELF	1·9	0·4	4·4	3·8	4·1	1·2	0·2	2·3	4·2
		FARELF	0·3	0·2	0·1	0·3	0·2	0·1	0·1	0·2	0·2
		Range	1·9	0·4	4·4	3·8	4·1	1·2	0·2		
046·0 046·1	Amoebiasis	UK	0·2	0·2	0·2	0·2	0·1	0·0	0·1	0·1	0·2
		BAOR	0·1	0·1	0·1	0·0	0·0	0·0	0·1	0·1	0·1
		MELF	0·5	0·3	0·4	0·2	0·2	0·1	0·1	0·3	0·4
		FARELF	3·9	3·8	3·3	3·1	2·3	1·6	1·3	2·8	2·6
		Range	3·8	3·7	3·2	3·1	2·3	1·6	1·2		
045 047–048	Dysentery (other than Amoebic)	UK	0·2	0·5	0·5	0·2	0·2	0·2	0·3	0·3	0·3
		BAOR	0·2	0·3	0·3	0·0	0·0	0·0	0·0	0·1	0·3
		MELF	11·1	16·7	22·5	27·1	22·6	23·8	18·5	20·3	16·0
		FARELF	8·6	7·2	8·1	7·2	5·9	5·4	2·8	6·5	5·8
		Range	10·9	16·4	22·2	27·1	22·6	23·8	18·5		
785·6 571–572 042, 049	Diarrhoea, Enteritis, and Food Poisoning	UK	6·9	5·9	5·6	5·9	4·3	6·2	6·2	5·9	2·6
		BAOR	6·4	3·7	4·7	3·6	3·7	6·4	3·7	4·6	2·8
		MELF	40·9	40·0	41·8	43·6	27·9	30·3	44·5	38·4	15·7
		FARELF	27·1	20·2	18·4	22·6	24·3	23·1	25·5	23·0	8·7
		Range	34·5	36·3	37·1	40·0	24·2	24·1	40·8		
092	Infective Hepatitis	UK	1·6	1·1	0·9	0·7	0·7	0·4	0·8	0·9	1·2
		BAOR	4·1	2·0	0·7	1·0	0·7	0·7	0·4	1·4	3·7
		MELF	4·0	6·7	5·0	6·8	4·0	5·0	4·3	5·0	2·8
		FARELF	14·4	13·2	6·5	3·8	4·4	3·3	6·4	7·4	11·1
		Range	12·8	12·1	5·8	6·1	3·7	4·6	6·0		
—	All Intestinal Diseases	UK	8·9	7·8	7·2	7·0	5·3	6·8	7·4	7·2	3·6
		BAOR	10·8	6·1	5·8	4·6	4·4	7·1	4·0	6·1	6·8
		MELF	58·4	64·1	74·1	81·5	58·8	60·4	67·7	66·4	23·1
		FARELF	54·3	44·6	36·4	37·0	37·1	33·5	36·1	39·9	20·8
		Range	49·5	58·0	68·3	76·9	54·4	53·6	63·7		

APPENDIX TABLE H

ADMISSIONS OF BRITISH ARMY MALES IN MAIN COMMANDS, 1950–1956
RATES PER 1,000 STRENGTH, PYREXIA OF UNKNOWN ORIGIN AND MALARIA

Int. List No.	Disease	Command	1950	1951	1952	1953	1954	1955	1956	Average	Range
788·8	Pyrexia of Unknown Origin ..	UK	1·7	1·7	1·8	2·6	2·3	1·8	1·5	1·9	1·1
		BAOR	0·9	1·7	1·9	2·0	0·6	0·8	0·4	1·2	1·6
		MELF	24·8	22·6	22·0	18·6	21·1	21·6	17·9	21·2	6·9
		FARELF ..	23·2	12·4	15·3	20·5	26·5	19·5	25·1	20·4	14·1
		Range	23·9	20·9	20·2	18·5	25·9	20·8	24·7		
		WEST AFRICA	23·6	21·0	38·5	23·9	26·2	38·5	34·7	29·5	17·5
110	Benign Tertian Malaria ..	UK	0·6	0·7	2·3	2·3	1·3	0·5	0·2	1·1	2·1
		BAOR	0·2	0·3	0·8	0·7	0·3	0·1	0·1	0·4	0·7
		MELF	4·4	1·9	1·2	2·1	8·1	3·5	0·3	3·1	7·8
		FARELF ..	8·9	8·8	6·8	4·8	5·3	2·9	1·6	5·6	7·3
		Range	8·7	8·5	6·0	4·1	7·8	3·4	1·5		
		WEST AFRICA	—	—	5·4	4·2	2·1	—	—	1·7	5·4
112	Malignant Tertian Malaria ..	UK	0·0	0·0	0·1	0·0	0·0	0·0	0·0	0·0	0·1
		BAOR	—	—	—	—	—	0·0	—	0·0	0·0
		MELF	5·5	2·4	0·4	—	0·3	0·0	—	1·2	5·5
		FARELF ..	2·5	6·2	3·9	4·3	3·3	1·8	1·4	3·3	4·8
		Range	5·5	6·2	3·9	4·3	3·3	1·8	1·4		
		WEST AFRICA	65·9	50·5	19·3	23·1	29·4	31·6	15·2	33·6	50·7
110–117	Total Malaria	UK	0·9	0·9	2·7	2·5	1·4	0·7	0·3	1·3	2·4
		BAOR	0·2	0·4	0·8	0·9	0·3	0·2	0·2	0·4	0·7
		MELF	11·4	4·9	2·0	3·0	8·5	3·8	0·4	4·9	11·0
		FARELF ..	12·7	15·2	11·1	10·0	8·9	4·7	3·5	9·4	11·7
		Range	12·5	14·8	10·3	9·1	8·6	4·5	3·3		
		WEST AFRICA	84·4	100·4	61·6	38·4	36·4	44·7	20·2	55·2	80·2

APPENDIX TABLE I

ADMISSIONS BRITISH ARMY OF MALES IN MAIN COMMANDS, 1950–1956
RATES PER 1,000 STRENGTH, APPENDICITIS AND PEPTIC ULCERATION

Int. List No.	Disease	Command	1950	1951	1952	1953	1954	1955	1956	Average	Range
550–553	Appendicitis ..	UK	7·9	7·7	9·2	8·5	8·3	7·6	7·8	8·1	1·6
		BAOR	6·6	6·2	6·1	7·4	6·4	6·5	5·5	6·4	1·9
		MELF	5·5	7·8	7·3	7·8	6·9	7·2	6·8	7·0	2·3
		FARELF ..	7·6	8·7	7·6	7·0	6·7	6·0	6·8	7·2	2·7
		Range	2·4	2·5	3·1	1·5	1·9	1·6	2·3		
Part of 540	Peptic Ulcer—Stomach ..	UK	1·7	1·6	2·0	1·8	1·1	0·8	0·6	1·4	1·4
		BAOR	2·0	1·0	1·1	1·6	1·4	0·9	0·7	1·2	1·3
		MELF	0·7	1·1	0·8	0·7	0·5	0·6	1·0	0·8	0·6
		FARELF ..	1·1	1·1	1·0	0·8	0·3	0·5	0·5	0·8	0·8
		Range	1·3	0·6	1·2	1·1	1·1	0·4	0·5		
541	Peptic Ulcer—Duodenum ..	UK	2·5	2·4	2·9	2·7	2·9	2·6	2·6	2·7	0·5
		BAOR	1·6	1·4	1·7	2·3	1·8	2·1	1·6	1·8	0·9
		MELF	1·3	1·1	1·2	0·9	1·4	1·5	2·3	1·4	1·4
		FARELF ..	1·4	1·1	2·6	2·0	1·1	1·9	2·3	1·8	1·5
		Range	1·2	1·3	1·7	1·8	1·8	1·1	1·0		
540 541	Total Peptic Ulcers	UK	4·8	4·7	5·6	5·3	4·5	4·1	4·2	4·7	1·5
		BAOR	4·6	3·7	4·0	5·2	4·2	4·1	3·0	4·1	2·2
		MELF	2·2	2·6	2·7	2·4	2·5	2·8	3·8	2·7	1·6
		FARELF ..	2·7	2·5	5·0	3·4	1·9	2·7	3·3	3·1	3·1
		Range	2·6	2·2	2·9	2·9	2·6	1·4	1·2		

Appendix Table J

ADMISSIONS OF BRITISH ARMY MALES IN MAIN COMMANDS, 1950–1956
RATES PER 1,000 STRENGTH, VARICOSE VEINS AND HERNIA

Int. List No.	Disease	Command	1950	1951	1952	1953	1954	1955	1956	Average	Range
460	Varicose Veins	UK	2·7	3·4	3·2	2·8	2·6	2·3	2·2	2·7	1·2
		BAOR	4·2	4·2	3·2	3·0	3·3	3·1	2·5	3·4	1·7
		MELF	2·7	2·2	2·4	2·3	1·6	1·5	1·7	2·1	1·2
		FARELF	3·6	3·8	3·5	2·4	3·2	1·6	1·7	2·8	2·2
		Range	1·5	2·0	1·1	0·7	1·7	1·6	0·8		
560 561	Hernia	UK	4·3	4·2	4·7	3·6	3·6	3·4	3·7	3·9	1·3
		BAOR	3·2	3·5	3·3	3·3	3·0	2·7	2·6	3·1	0·9
		MELF	2·5	2·4	2·3	2·4	2·7	2·2	1·8	2·3	0·9
		FARELF	3·5	3·1	3·3	2·6	3·1	2·7	1·9	2·9	1·6
		Range	1·8	1·8	2·4	1·2	0·9	1·2	1·9		

Appendix Table K

ADMISSIONS OF BRITISH ARMY MALES IN MAIN COMMANDS, 1950–1956
RATES PER 1,000 STRENGTH, PSYCHIATRIC CONDITIONS

Int. List No.	Disease	Command	1950	1951	1952	1953	1954	1955	1956	Average	Range
300–309	Psychoses	UK	0·9	0·4	0·4	0·8	0·7	1·0	0·8	0·7	0·6
		BAOR	0·9	0·2	0·4	1·5	0·8	1·0	0·2	0·7	1·3
		MELF	0·6	0·4	0·5	0·6	1·5	0·7	0·6	0·7	1·1
		FARELF	0·4	0·6	1·0	0·8	0·9	1·1	0·6	0·8	0·7
		Range	0·5	0·4	0·6	0·9	0·8	0·4	0·6		
310–324 326	Psychoneuroses and Disorders of Personality	UK	4·9	5·2	4·8	3·0	3·1	3·6	4·2	4·1	2·2
		BAOR	3·4	2·4	2·4	2·7	2·9	3·0	3·6	2·9	1·2
		MELF	4·2	3·4	2·0	3·4	1·9	3·8	4·3	3·3	2·4
		FARELF	7·7	5·6	3·7	4·0	5·4	2·2	3·0	4·5	5·5
		Range	4·3	3·2	2·8	1·3	3·5	1·6	1·3		
325	Mental Deficiency	UK	0·2	0·2	0·3	0·8	0·2	0·1	0·1	0·3	0·7
		BAOR	0·3	0·1	0·2	0·3	0·2	0·0	0·1	0·2	0·3
		MELF	0·5	0·2	0·1	0·4	0·2	0·2	0·2	0·3	0·4
		FARELF	0·5	0·5	1·1	0·3	0·2	0·0	0·1	0·4	1·1
		Range	0·3	0·4	1·0	0·5	0·0	0·2	0·1		
—	Total Psychiatric Conditions	UK	6·1	5·8	5·5	4·6	3·9	4·6	5·1	5·1	2·2
		BAOR	4·6	2·7	3·0	4·5	3·9	4·0	3·8	3·8	1·9
		MELF	5·3	4·0	2·6	4·3	3·5	4·7	5·1	4·2	2·7
		FARELF	8·5	6·7	5·8	5·1	6·6	3·3	3·7	5·7	5·2
		Range	3·9	4·0	3·2	0·8	3·1	1·4	1·4		

APPENDIX TABLE L

ADMISSIONS OF BRITISH ARMY MALES IN MAIN COMMANDS, 1950–1956
RATES PER 1,000 STRENGTH, INTERNAL DERANGEMENT OF THE KNEE AND EFFECTS OF CLIMATE

Int. List No.	Injury	Command	1950	1951	1952	1953	1954	1955	1956	Average	Range
734	Internal Derangement of the Knee	UK	2·5	3·0	3·1	2·3	3·2	3·8	4·3	3·2	2·0
		BAOR	5·5	2·7	2·3	3·4	5·4	4·2	3·1	3·8	3·2
		MELF	4·6	4·2	2·4	3·2	2·2	2·6	1·9	3·0	2·7
		FARELF	4·7	8·3	5·4	3·3	2·6	2·8	3·8	4·4	5·7
		Range	3·0	5·6	3·1	1·1	3·2	1·6	2·4		
N 981·0 981·1 981·2 981·3	Effects of Heat	UK	0·1	0·0	0·1	0·0	0·0	0·1	0·0	0·0	0·1
		BAOR	—	0·0	0·0	0·1	0·1	0·1	0·0	0·0	0·1
		MELF	0·6	1·9	1·7	1·7	0·6	1·7	1·8	1·4	1·3
		FARELF	1·5	1·1	1·1	2·2	1·4	1·1	1·7	1·4	1·1
		Range	1·5	1·9	1·7	2·2	1·4	1·6	1·8		
N 980·0 980·1	Effects of Cold	UK	—	—	0·0	0·0	0·0	0·0	0·0	0·0	0·0
		BAOR	—	0·0	0·0	0·0	0·1	0·4	2·1	0·4	2·1
		MELF	0·0	—	—	—	—	—	—	0·0	0·0
		FARELF	0·0	—	0·0	—	0·0	0·0	—	0·0	0·0
		Range	0·0	0·0	0·0	0·0	0·1	0·4	2·1		

APPENDIX TABLE M

DEATHS—BRITISH ARMY MALES
Actual Numbers of Cases

International List No.	"B" List No.	Disease	(1948)	(1949)	1950	1951	1952	1953	1954	1955	1956	Average	Range
001–008	1–2	Tuberculosis	(131)	(78)	30	10	11	2	2	2	1	8	29
140–205	18–19	Neoplasms			39	34	36	44	43	30	42	38	14
410–416 420–422 430–434	25–27	Cardiac Conditions			30	26	17	27	28	24	27	26	13
330–334	22	Vascular Lesions Affecting Central Nervous System			14	12	14	13	15	5	4	11	11
080	12	Poliomyelitis			8	9	8	4	9	4	2	6	7
001–799	1–46	All Diseases			197	161	155	166	167	136	123	158	74
N800–N999	N47–N50	Injuries U.K.			49	77	69	63	67	78	64	67	29
		Injuries Overseas			183	313	300	240	219	191	247	242	130
		Enemy Action (included above)			Not Available	131	35	18	6	22	48		
001–N999	1–N50	Total Deaths (All Causes)			429	551	524	469	453	405	434	466	146

APPENDIX TABLE N

SEASONAL FLUCTUATIONS IN ADMISSION RATES FOR CERTAIN DISEASES
Percentage each month of admission rates for the year, percentages averaged over 1950–1956, United Kingdom

Disease	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total	Annual Rate per 1,000 Strength
Tonsillitis and Pharyngitis	9·5	12·2	13·6	10·2	9·9	7·9	6·3	5·8	6·0	5·8	6·8	6·2	100	37·5
Common Cold	17·7	16·6	14·8	6·9	5·8	4·3	3·3	2·8	5·3	5·9	7·6	9·1	100	23·8
Influenza	26·4	19·2	16·2	6·8	4·2	2·3	2·0	1·9	2·6	4·1	6·6	7·6	100	14·1
Bronchitis	13·3	12·9	12·1	7·0	6·6	5·0	4·7	4·9	6·6	8·2	9·5	9·1	100	8·2
Pneumonia	14·1	13·5	12·9	9·8	8·4	6·8	5·4	4·0	4·7	5·3	7·2	7·6	100	3·8
Skin Conditions	8·1	9·0	8·5	7·4	8·4	8·7	8·5	7·5	9·0	9·3	9·2	6·2	100	33·0
Diarrhoea and Enteritis	8·5	8·8	7·1	6·4	7·6	8·8	9·6	8·2	9·1	9·4	10·5	6·2	100	5·7
All Diseases	11·1	11·1	10·4	8·1	8·4	8·0	7·2	6·5	7·3	7·5	8·2	6·4	100	260·9

Appendix Table O

SEASONAL FLUCTUATIONS IN ADMISSION RATES FOR CERTAIN DISEASES

Percentage each month of admission rates for the year, percentages averaged over 1950–1956, British Army of the Rhine

Disease	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total	Annual Rate per 1,000 Strength
Tonsillitis and Pharyngitis	10·9	10·8	11·1	8·5	7·6	6·5	6·6	6·9	9·2	7·2	7·6	7·2	100	25·0
Common Cold	18·7	15·6	11·9	6·3	5·2	3·9	3·8	3·5	8·5	8·8	6·3	7·7	100	6·9
Influenza	17·4	25·5	16·6	9·2	3·6	2·6	3·3	3·0	4·6	4·1	4·6	5·6	100	7·7
Bronchitis	12·1	11·2	10·8	7·2	5·7	6·3	6·6	4·7	8·0	10·4	8·5	8·4	100	4·3
Pneumonia	11·7	13·1	9·9	7·7	7·0	7·7	6·9	5·0	6·2	7·2	7·3	10·0	100	2·4
Skin Conditions	8·4	8·4	8·4	8·0	8·5	7·8	8·1	8·2	9·8	9·0	8·5	6·9	100	41·5
Diarrhoea and Enteritis ..	5·9	8·0	5·7	5·5	7·5	8·2	8·0	12·5	15·4	9·2	7·5	6·5	100	4·1
Infective Hepatitis ..	11·5	11·5	7·1	6·4	8·6	7·0	6·8	8·7	7·5	8·4	9·3	7·5	100	1·4
All Diseases	9·8	10·0	9·0	8·0	7·9	7·7	7·9	7·8	8·7	8·4	8·2	6·5	100	240·9

Appendix Table P

SEASONAL FLUCTUATIONS IN ADMISSION RATES FOR CERTAIN DISEASES

Percentage each month of admission rates for the year, percentages averaged over 1950–1956, Middle East Land Forces

Diseases	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total	Annual Rate per 1,000 Strength
Tonsillitis and Pharyngitis	10·2	9·4	9·1	7·8	7·7	8·0	7·6	7·6	7·1	8·4	8·8	8·2	100	34·8
Otitis Externa and Media ..	5·5	4·7	4·2	5·5	7·8	10·0	14·1	12·7	11·9	10·3	7·7	5·9	100	9·9
Skin Conditions	7·7	8·1	7·6	7·7	8·0	8·0	8·5	9·1	9·0	9·5	9·2	7·6	100	51·5
Dysentery (other than Amoebic)	1·5	0·9	2·0	8·2	11·7	15·5	14·5	11·9	12·7	9·3	7·7	4·0	100	20·3
Diarrhoea and Enteritis ..	2·6	2·2	3·1	8·0	11·2	12·9	12·8	12·5	13·3	10·2	7·0	4·4	100	37·4
Infective Hepatitis	11·9	7·4	4·1	2·7	3·5	5·8	6·7	8·2	10·6	13·6	14·8	10·9	100	5·1
Pyrexia of Unknown Origin	4·4	4·1	5·3	7·5	9·9	10·5	12·3	12·5	12·2	9·1	7·4	4·8	100	21·2
Malaria	3·6	5·2	3·2	5·0	7·3	10·4	9·9	14·0	16·0	15·0	5·1	5·2	100	4·9
All Diseases	6·8	6·4	6·3	7·3	8·6	9·7	10·0	10·0	10·5	9·6	8·4	6·3	100	328·9

Appendix Table Q

SEASONAL FLUCTUATIONS IN ADMISSION RATES FOR CERTAIN DISEASES

Percentage each month of admission rates for the year, percentages averaged over 1950–1956, Far East Land Forces

Diseases	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total	Annaul Rate per 1,000 Strength
Skin Conditions	7·6	7·5	6·7	7·5	8·0	8·3	10·1	10·4	10·6	8·9	7·6	6·8	100	74·2
Amoebiasis	6·9	8·1	9·1	8·3	9·5	9·2	7·9	8·7	11·5	8·6	6·7	5·6	100	2·8
Dysentery (other than Amoebic)	5·7	8·1	11·0	9·5	6·9	12·1	7·4	13·0	7·8	5·7	9·4	3·3	100	6·5
Diarrhoea and Enteritis ..	5·7	8·2	10·6	9·3	11·9	12·7	9·6	7·5	7·2	6·5	5·4	5·5	100	22·3
Infective Hepatitis	9·8	7·3	7·2	9·8	11·5	10·5	9·7	8·0	7·7	5·1	7·1	6·2	100	7·4
Pyrexia of Unknown Origin	6·9	6·2	7·7	9·7	11·6	11·1	9·2	8·4	7·9	7·3	7·0	7·1	100	20·4
Malaria	7·1	5·3	4·1	6·6	9·8	9·9	10·8	10·1	9·7	9·8	9·6	7·3	100	9·4
All Diseases	8·1	7·7	8·0	8·2	8·5	9·2	9·7	8·5	8·9	8·0	7·8	6·9	100	457·6

APPENDIX TABLE R

AVERAGE ADMISSION RATES PER 1,000 STRENGTH BY AGE GROUPS, 1951–1952
British Army Males

Diagnosis	Int. List No.	Command	Age Groups (yrs)						
			19 and Under	20–24	25–29	30–34	35–39	40–44	45 and Over
Total Admissions	001–N999	UK	273·1	250·5	249·4	183·2	154·8	163·1	173·4
		BAOR	278·9	322·5	312·1	233·8	205·2	192·5	187·3
		MELF	355·0	374·6	365·4	291·8	232·1	235·4	260·8
		FARELF	456·1	572·5	528·3	359·4	317·2	275·8	243·6
Total Injuries	N800–N999	UK	36·1	35·2	32·8	21·6	15·4	16·2	10·4
		BAOR	53·7	61·3	67·8	44·3	34·6	23·2	18·0
		MELF	37·0	44·4	44·2	36·5	33·9	21·2	20·9
		FARELF	49·8	57·2	56·7	48·4	43·9	29·8	30·9
Respiratory Diseases	470–502	UK	89·0	63·1	48·2	31·5	23·0	19·6	23·5
		BAOR	52·5	48·1	34·5	20·9	20·4	17·4	15·6
		MELF	55·8	50·1	42·7	30·8	20·6	23·2	34·8
		FARELF	47·5	50·8	38·0	26·9	22·0	31·5	17·6
Common Cold and Influenza	470, 480–483	U.K.	34·9	24·2	18·2	10·7	7·1	5·8	4·6
Otitis Externa and Media	390–392	MELF	13·0	13·7	13·4	8·5	5·8	6·2	7·8
		FARELF	16·5	16·0	14·8	9·2	9·1	4·2	—
Skin Diseases	690–716, 131, 135	UK	33·9	27·4	20·9	12·3	8·7	8·3	7·8
		BAOR	53·9	46·2	33·5	24·8	19·2	13·6	5·4
		MELF	67·1	60·9	49·7	38·3	20·0	20·5	19·7
		FARELF	109·3	72·7	54·6	33·6	34·1	29·5	33·7
Tinea	131	FARELF	40·8	15·2	9·8	4·2	5·5	1·2	5·3
Venereal Disease	020–039	UK	1·4	6·6	11·1	6·8	3·9	2·6	0·9
		BAOR	8·6	27·5	34·0	17·5	10·6	6·9	2·3
		MELF	6·0	19·9	27·4	14·6	4·6	3·0	1·3
		FARELF	42·1	140·2	131·9	64·8	32·3	19·6	12·3
Intestinal Diseases	040–049, 092, 571–572, 785·6	MELF	71·8	56·8	37·1	26·0	17·8	22·1	16·0
		FARELF	39·8	40·7	35·4	22·0	18·4	17·1	15·1
Infective Hepatitis	092	MELF	4·6	7·3	4·4	2·6	2·1	3·0	1·9
		FARELF	2·8	12·3	8·9	4·4	3·6	2·4	2·6
Pyrexia of Unknown Origin	788·8	MELF	11·9	13·4	13·5	9·6	4·8	6·4	5·2
		FARELF	9·9	10·0	11·4	6·7	7·3	6·4	5·0
Malaria	110–117	FARELF	12·2	15·1	13·7	9·5	5·5	3·6	1·4
The Standard Error is approximately the square root of a Rate multiplied by these Factors		UK	0·07	0·09	0·18	0·21	0·22	0·27	0·34
		BAOR	0·14	0·14	0·29	0·36	0·39	0·54	0·74
		MELF	0·15	0·15	0·33	0·43	0·45	0·65	0·86
		FARELF	0·22	0·19	0·36	0·46	0·53	0·77	1·13

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INVESTIGATION INTO THE WORKING OF THE "DEATH BENEFIT" FOR COALWORKERS' PNEUMOCONIOSIS

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Section 7(*c*) of the National Insurance (Industrial Injuries) Act (1946) states that "industrial death benefit (in this Act referred to as "death benefit") shall be payable to such persons as are hereinafter provided if the death of the insured person results from the injury", and death benefit has therefore been paid to relatives (under certain specified conditions) of those dying from coalworkers' pneumoconiosis since 1948.

Difficulties have arisen in relation to the working of this Act in two ways:

(*a*) It has always been difficult for laymen and to a lesser extent for doctors to differentiate between those suffering from a chronic condition such as pneumoconiosis who die and those who die of pneumoconiosis. The difficulty is particularly obvious in the case of a miner who has been receiving a high rate of disablement benefit before he dies of some condition unconnected with his pneumoconiosis. The relatives are not unreasonably surprised when no death benefit is payable.

(*b*) There is a very real difficulty medically in deciding the exact cause of death in elderly people who are known to be suffering from pneumoconiosis. The difficulty often remains when *post mortem* evidence is available.

In these circumstances it is not surprising that there is considerable discontent about the working of the Act in areas such as South Wales where there is a high prevalence of pneumoconiosis, and a quantitative investigation seemed justified.

Material and Methods

The problem is not a simple one. The only figures available administratively are the number of men in receipt of industrial injury benefit for pneumoconiosis who die, the number of cases in which death benefit is claimed, and the number in which benefit is given. From such material no definite conclusions can be drawn, and one has to turn to more specialized investigations; we were fortunate in having available the Rhondda Fach population, which has been closely studied for several years.

The Rhondda Fach is one of the smaller Welsh mining valleys with a population of about 30,000. 90 per cent. of the population had their chests *x*-rayed in 1950 (Cochrane, Cox, and Jarman, 1952), and the population has been carefully studied ever since. In Table I the particular material used in this study has been summarized. All the miners and ex-miners *x*-rayed in 1950–51 have been carefully followed up for 6 years and death certificates have been obtained for all those who have died. We are confident that we have information about all those who died in the valley; we are naturally less certain

TABLE I

SUMMARY OF THE 6-YEAR FOLLOW-UP OF MINERS AND EX-MINERS IN THE RHONDDA FACH

X-Ray Category* 1950–51		Number	Number Dead 1950–56	Number of *post mortem* Examinations	Number of Pneumoconiosis Deaths (001 and 523)
Normal and Simple Pneumoconiosis		5,429	626	186	11
Massive Pulmonary Fibrosis	A ..	386	48	27	7
	B, C, D	659	192	128	104
Unknown (Lapses)		201	131	3	1
Total		6,675	997	344	123

* I.L.O. International Classification, 1950.

about those who have left the valley, but we went to great lengths to trace them all. All the death certificates were coded by the Registrar General's department. The vast majority of the *post mortem* examinations were carried out in the Department of Pathology, Cardiff Royal Infirmary.

Two points must be made in connexion with Table I. If it is compared with similar Tables in our previous publication (Carpenter and Cochrane, 1956), some differences will be found. These have been caused by a re-check of the population at a new census, resulting in a few transfers from the "non-miner" group into the "miner and ex-miner" group, and *vice versa*. In addition, we attempted to reduce the number of lapses retrospectively by a search for chest *x*-rays from all other sources, and by being somewhat less fussy about the dates on which they were taken. The other point concerns the high death rate amongst the lapses. This is, of course, not, as some field workers may have hoped, a judgement from Heaven on their lack of co-operation, but is simply due to the fact that it is very difficult and sometimes inadvisable to *x*-ray the aged and infirm, who have a reduced life expectancy. In point of fact, 133 of the 201 lapses were over the age of 65 in 1950–51. As they were not "certified" or "diagnosed" in life as suffering from pneumoconiosis, and their relatives only asked for *post mortem* examinations on three occasions with a view to obtaining benefit, it is very improbable that many were suffering from progressive massive fibrosis (P.M.F.). This high death rate amongst the lapses is thus unlikely to be a source of error in this study. Both points will be dealt with at greater length in a subsequent paper on mortality rates of miners and ex-miners.

From this material we have selected those with the more advanced type of P.M.F. (B, C, and D shadows) for more detailed study, as shown in Table II.

TABLE II

EXPECTED AND OBSERVED DEATHS AMONGST MINERS AND EX-MINERS WITH B, C, AND D SHADOWS IN 1950–1951

Age (yrs)	Number of Cases	Deaths		Excess Deaths
		Observed	Expected	
20–24	1	—	—	—
25–34	26	1	0·3	0·7
35–44	128	15	2·8	12·2
45–54	150	29	9·3	19·7
55–64	184	51	29·4	21·6
65–74	129	70	44·1	25·9
75–84	40	25	24·2	0·8
85+	1	1	0·9	0·1
Total ..	659	192	111·0	81·0

In this Table the observed and expected deaths are compared. The rates for the expected deaths were worked out by one of us (R. G. C.) using the Registrar General's death rates for all males in England and Wales and the method outlined previously (Carpenter and Cochrane, 1956).

At this stage it would seem natural to proceed to the cases for which benefits are paid, but this seemed to us unjustifiable, because in many cases where a claim might reasonably have been made there were either no relatives or the relatives were unwilling to make a claim. The figure for benefits paid would therefore be meaningless. We decided, therefore, to adopt a more theoretical approach by assuming that a claim was made in every case, and then estimating from our knowledge of the working of the Pneumoconiosis Medical Panels of the Ministry of Pensions and National Insurance, how many would have been allowed. This could roughly be termed the "observed benefits". At the same time we attempted to estimate from the data how many ought to have been given benefits—roughly the "expected benefits".

We believe that most people would agree that the "expected benefits" should equal the excess deaths as shown in Table II, but there are one or two points that require amplification. The figure for the "excess" deaths is dependent on the rates used to calculate the "expected" deaths, and if the rates used were inappropriate a serious bias could be introduced. The rates used were based on the Registrar General's figures for all males in England and Wales, and their use would be inappropriate if:

(1) There was some local environmental factor in the Rhondda Fach (other than mining) which caused excessively high or low mortality. This is rendered very unlikely by the fact that the use of the same rates to the male non-mining population of the Rhondda Fach gives an S.M.R. of approximately 100 (Carpenter and Cochrane, 1956).

(2) The miners in the Rhondda Fach were selected in such a way as to have an expectation of life different from the average. This is a difficult point to investigate, but the balance of the evidence suggests that the population with which we are dealing was somewhat negatively selected in that the healthier members of the community tended to emigrate in the 1920s and 1930s. If so, the appropriate rates should have been a little higher and the excess deaths somewhat lower. It does, however, seem probable that the excess deaths give a reasonable measure of the "expected" benefits, the errors, if any, tending to make this figure too high.

Our approach to the problem of estimating the "observed" benefits is shown in Table III. The first column gives the deaths coded by the Registrar General as being due to pneumoconiosis (001 and 523). The next column gives the number of these deaths in which the cause of death was based on *post mortem* evidence. In general, one might argue that, if a claim were made and the death certificate stated that death was due to pneumoconiosis, the Pneumoconiosis Medical Panel would advise that the claim be allowed, and this would be true except in very rare cases. But in order to be quite sure that we have not over-estimated the "observed" benefits, it is safer to use the figure for the cases in which *post mortem* evidence was available. Here we can be quite certain that all claims would be allowed, for the simple reason that if they were refused there would certainly be an appeal, which, if supported by evidence from a University Department of Pathology, would certainly be successful.

TABLE III

ESTIMATE OF THE NUMBER OF POTENTIAL BENEFITS AMONGST THE B, C, AND D DEATHS

Age (yrs)	(1) Number of Pneumoconiosis Deaths	(2) Number Based on *post mortem* Examination	(3) Number of Non-Pneumoconiosis Deaths in which Benefit was Given	(4) (2) plus (3)
25–34	1	1	—	1
35–44	11	9	1	10
45–54	20	20	—	20
55–64	32	29	2	31
65–74	34	29	3	32
75–84	6	4	—	4
85+	—	—	—	—
Total	104	92	6	98

In addition to these 92, there is another small group which can safely be added (third column, Table III). This consists of cases in which the cause of death on the certificate was not given as pneumoconiosis but in which a death benefit claim was allowed. These were mainly deaths due to cardiovascular disorder according to the certificates. They were found by a direct search of all the records. Clearly the number of such cases (6) would have been much greater if claims had been made in all cases. We can therefore be sure that the combined figure for the "observed" benefits is a considerable under-estimate.

In Table IV the "expected" and "observed" benefits are compared, and it is clear that the latter are greater than the former, in spite of the fact that the figure for "observed" benefits is certainly an under-estimate, and that for "expected" benefits probably an over-estimate. There seems, therefore, little doubt that the Pneumoconiosis Medical Panels in this area are erring on the generous side.

TABLE IV

COMPARISON BETWEEN EXCESS DEATHS AND POTENTIAL BENEFITS

Age (yrs)	Excess Deaths	Total Potential Benefits
25–34	0·7	1
35–44	12·2	10
45–54	19·7	20
55–64	21·6	31
65–74	25·9	32
75–84	0·8	4
85+	0·1	—
Total ..	81·0	98

SUMMARY

An investigation has been carried out into the working of the "Death Benefit" in relation to coal-workers' pneumoconiosis. Using material derived from the follow-up of the Rhondda Fach miners and ex-miners *x*-rayed in 1951, and assuming that every miner who died had relatives who all made claims, estimates were obtained of "expected" and "observed" benefits. When compared, these estimates suggested that the Pneumoconiosis Medical Panel in that area was being, as expected, generous.

We should like to acknowledge the assistance we have had from many friends and colleagues in different fields. We should, in particular, like to thank Dr. A. Caplan of the Cardiff Pneumoconiosis Medical Panel of the Ministry of Pensions and National Insurance.

REFERENCES

Carpenter, R. G., and Cochrane, A. L. (1956). *Brit. J. Industr. Med.*, 13, 102.

Cochrane, A. L., Cox, J. G., and Jarman, T. F. (1952). *Brit. med. J.* 2, 843.

National Insurance (Industrial Injuries) Act, 1946. Section 7(c).

Brit. J. prev. soc. Med. (1959), **13**, 131–138

PEPTIC ULCER IN TOWN AND COUNTRY

BY

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Striking geographical variations in the incidence of peptic ulcers have been reported from several countries. Dogra (1940) for instance, found peptic ulcer to be far more common in Southern than in Northern India, and Konstam (1954) reported a higher incidence in Southern than in Northern Nigeria.

These differences are not confined to large geographical areas, and in Great Britain, Morris and Titmuss (1944) demonstrated a lower mortality in rural than in urban communities, while Doll, Jones, and Buckatzsch (1951) reported a low incidence amongst agricultural workers. Similar trends have been reported from other countries, *e.g.* Bager (1929) in Sweden, Ginanneschi (1938) in Italy, and Alsted (1953) in Denmark.

Watkinson (1958a), in a planned study of autopsies performed between December, 1955, and November, 1956, in selected hospitals in England and Scotland, found a significantly higher incidence of duodenal ulcers in the North than in the South of England—a difference more marked in men than in women.

Present Study

A survey of the incidence of new cases of peptic ulceration occurring in the City of York and the surrounding countryside was carried out in the 6 years, 1952–1957. The total population served by York is approximately 225–250,000, but, owing to the overlap with other hospital areas, the present report is confined to the City of York and to a rural area to the north, south, and east of the city, which is served exclusively by York. The total population of York is 105,371, and of the country area 33,335. The incidence has been related to the population aged 15 and over:—

Area	Men	Women
York	38,454	43,725
Country	13,142	12,163

Method.—During the 6 years, 1952–1957, every new patient diagnosed amongst the residents of this area has been recorded, even though the diagnosis was first made outside York; for instance, one patient suffered a perforation during a holiday in Sweden and another when on a visit to Toronto. A "new" patient is defined as one in whom the diagnosis has not previously been established. The review covers both hospital and private practice.

Any estimate of ulcer incidence is influenced by the criteria of diagnosis, in particular, of radiological diagnosis. For this reason, only those diagnoses that are beyond doubt, however made, have been accepted, and the estimates are, therefore, conservative. The criteria used in this study were:

(1) Acute perforation.
(2) Haemorrhage with demonstrable ulcer.
(3) Ulcers found at laparotomy or gastroscopy.
(4) Radiologically demonstrable ulcer.
(5) Ulcers found at autopsy (but only if this confirms a previously doubtful or negative radiological finding). Ulcers found incidentally in persons not known to have experienced symptoms are excluded, as it is felt this might give a false increase in the York figures as compared with the rural area.

TABLE I

TOTAL NEW ULCERS DIAGNOSED 1952–1957 IN YORK AND COUNTRY

Sex	Men					Women				
Site of Ulcer	Duodenal	Gastric		Gastric and Duodenal	Total	Duodenal	Gastric		Gastric and	Duodenal Total
		Body	Antrum				Body	Antrum		
York	546	109	27	8	690	165	73	11	5	254
Country	112	17	4	0	133	39	16	0	0	55
Total	658	126	31	8	823	204	89	11	5	309

RESULTS

A total of 1,132 patients (823 men and 309 women) were diagnosed. The details of the type of ulcer are set out in Table I.

The symptoms leading to hospital attendance and diagnosis are shown in Table II; classification in the categories haemorrhage or perforation does not necessarily indicate the initial symptoms, as other symtoms may have been present previously without the patient seeking medical advice.

TABLE II

DISTRIBUTION PER CENT., BY SYMPTOMS LEADING TO PATIENTS' ATTENDANCE AT HOSPITAL

Sex	Men	Women
Clinical Symptoms	70·5	75·7
Haemorrhage	15·8	16·5
Perforation	13·7	7·8

The percentage of women presenting with acute perforation (7·8 cent.) is appreciably less than the percentage of men (13·7 per cent.), probably because the ratio of duodenal to gastric ulcers is less in women (2 : 1) than in men (4 : 1).

These figures can be related to the population at risk and expressed as the mean annual incidence rates. The overall incidence per 1,000 aged 15 and over for men and women in the area on this basis was therefore:

Site of Ulcer	Men	Women
Duodenal	2·15	0·62
Gastric	0·53	0·31

When analysed on a town and country basis, the incidence of gastric and duodenal ulcers, in both sexes, was found to be higher in the town than in the country (Table III), the difference for men, but not for women, being statistically significant. This finding could possibly be due to the fact that country people were less complaining or less willing to see their own doctor or attend at a hospital for investigation. However, no such selection could affect the number of acute perforations occurring in this area, because these are all referred to York.

The ratio between the incidence of acute perforated duodenal ulcers (old and new patients) in York and the country area was the same as that for all duodenal ulcers (Table III) 1·7 : 1. This difference between town and country is, therefore, in all probability, real.

The difference, at least for male duodenal ulcers, was more marked in the 2 years, 1952–1953, than in

TABLE III

MEAN ANNUAL INCIDENCE OF ULCERS IN YORK AND COUNTRY

Sex	Type of Ulcer†	Mean Annual Incidence Rate per 1,000		Ratio York : Country	Significance of Difference	
		York	Country		χ^2	
Men	Duodenal	2·40	1·42	1·7 : 1	26·25	$p < .001$
	Gastric*	0·62	0·27	2·3 : 1	14·08	$p < .001$
Women	Duodenal	0·65	0·53	1·2 : 1	1·19	$.2 < p < .3$
	Gastric*	0·34	0·22	1·5 : 1	2·66	$.1 < p < .2$

* Gastric includes ulcers of the body of the stomach and of the antrum.
† Double active ulcers and included in both categories (duodenal and gastric).

1956–1957 (Table IV), this being due to a decline in male duodenal ulcers in York, whereas the incidence remained constant in the country. The diminution in York was apread over all social orders and all age groups, but was more marked in patients with short histories (1 to 2 years) than in those with long histories (5 years or more). For this reason, it is unlikely that the 1952–1953 rate was abnormally high because patients, not previously investigated, took advantage of the easier diagnostic facilities in the early years of the National Health Service. Again, the total acute perforation rate (old and new patients) for duodenal ulcers in York showed a similar decline from 0·55 to 0·29 per thousand at risk.

In the latter part of this period, the incidence in some of the country parishes was already as high as in the town, so it may well be that no difference between town and country could now be demonstrated in other parts of Britain.

The incidence of gastric ulcers in men, and of both gastric and duodenal ulcers in women, showed no such decline and remained almost constant.

TABLE IV

COMPARISON OF MEAN ANNUAL INCIDENCE RATE PER THOUSAND AT RISK OF MALE DUODENAL ULCERS IN TOWN AND COUNTRY FOR THE TWO YEARS, 1952–53 and 1956–57

Year	York	Country	Ratio York : Country
1952–3	2·76	1·33	2·1 : 1
1956–7	1·82	1·37	1·3 : 1

INCIDENCE AND AGE.—The difference between town and country could not be due to a different age distribution between the two populations as it was demonstrable at all ages (Fig. 1). The findings for gastric ulcers in men and for both gastric and duodenal ulcers in women confirm this trend, but are less reliable because the numbers are small.

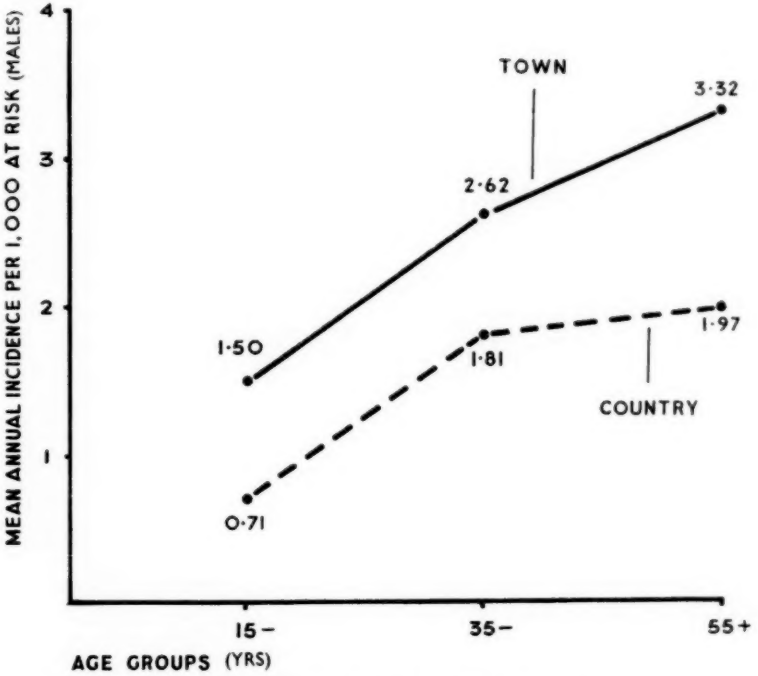

FIG. 1.—Comparative incidence of male duodenal ulcers for town and country, by age.

Age is, however, important in relation to incidence. The age distribution of ulcers in the City of York shows that the highest numbers of both duodenal ulcers (Table V, and Fig. 2, opposite) and gastric ulcers (Table VI, and Fig. 3, opposite) in men were diagnosed in the 45 to 54-year age group, but when these figures were related to the numbers at risk, the highest incidence for both was seen in the 55 to 64-year age group.

This, however, only indicates the age incidence at diagnosis, not the age when symptoms first occur; the latter is more difficult to assess owing to the often insidious onset of symptoms.

Furthermore, there is the additional inaccuracy of relating such figures to the present age distribution of the population, Any assessment, therefore, can only be approximate. Allowing for these inaccuracies, the finding shown in Fig. 2 suggests that in men there is an equal liability for a duodenal ulcer to start at any age from 25 to 64 years, but that the risk before age 25 and after age 65 is somewhat less. On the other hand, gastric ulcers (body of stomach only) show a peak incidence of onset of symptoms in the 45 to 54 and 55 to 64-year age groups.

In women, the largest number of duodenal ulcers was diagnosed in the 45 to 54-year age group, and this was also the peak incidence when related to the numbers at risk. In contradistinction to male duodenal ulcers, there was a peak for the onset of symptoms in females in the 35 to 44-year group. The number of gastric ulcers diagnosed was the same for the three oldest age groups the highest incidence in relation to population at risk coming in the 55 to 64-year group, with only a slight fall in the 65+ age group. The peak age for onset of symptoms is 45 to 54 years.

These findings suggest that age is a factor in the incidence of male gastric ulcers, and in both duodenal and gastric ulcers in women, but is less significant in male duodenal ulcers.

INCIDENCE AND SOCIAL CLASS.—Doll and others (1951) showed that social status, by itself, had no influence on the incidence of duodenal ulcers, but that gastric ulcers were more common among semi-skilled workers than among members of the higher social orders.

TABLE V

AGE DISTRIBUTION OF DUODENAL ULCERS IN THE CITY OF YORK, 1952–57

Age (yrs)	Number of Cases				Mean Annual Incidence Rates per 1,000			
	Men		Women		Men		Women	
	Diagnosis	Onset	Diagnosis	Onset	Diagnosis	Onset	Diagnosis	Onset
15–	36	57	7	16	·93	1·43	·17	·37
25–	88	120	21	26	1·97	2·68	·44	·55
35–	95	111	42	44	2·02	2·37	·83	·87
45–	137	94	47	33	3·21	2·20	1·03	·71
55–	111	74	25	15	3·69	2·47	·68	·40
65–	74	40	23	15	2·75	1·48	·63	·38
All Ages	542	496*	165	149*	2·35	2·15	0·63	·57

* These totals are less than the corresponding numbers diagnosed because of the omission of patients in whom the history of illness was unreliable, or in whom the onset occurred before age 15.

TABLE VI

AGE DISTRIBUTION OF GASTRIC ULCERS (BODY OF STOMACH ONLY) IN THE CITY OF YORK, 1952–57

Age (yrs)	Number of Cases				Mean Annual Incidence Rates per 1,000			
	Men		Women		Men		Women	
	Diagnosis	Onset	Diagnosis	Onset	Diagnosis	Onset	Diagnosis	Onset
15–	1	4	0	0	·03	·10	—	—
25–	10	17	5	6	·22	·38	·10	·13
35–	17	20	11	11	·36	·42	·22	·22
45–	36	29	19	21	·84	·68	·41	·46
55–	32	20	19	13	1·06	·66	·52	·35
65–	13	10	19	9	·48	·37	·49	·23
All Ages	109	100*	73	60*	·47	·43	·28	·23

* These totals are less than the corresponding numbers diagnosed because of the omission of patients in whom the history of illness was unreliable, or in whom the onset occurred before age 15.

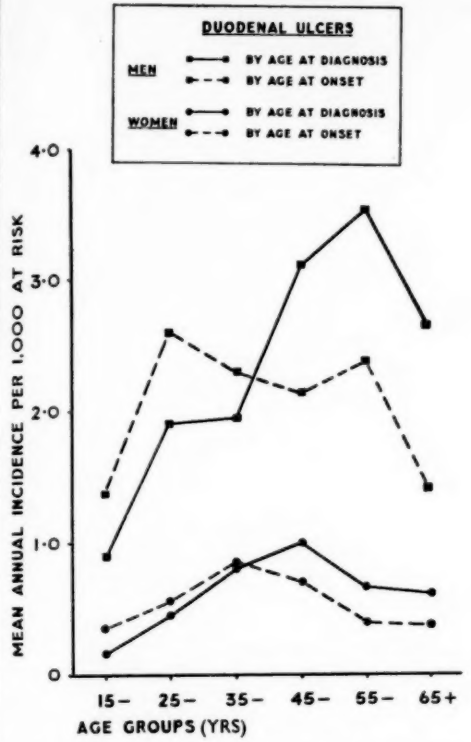

FIG. 2.—Distribution of duodenal ulcers for the City of York, by sex, age at diagnosis, and age at onset. Patients under 15 at diagnosis are omitted.

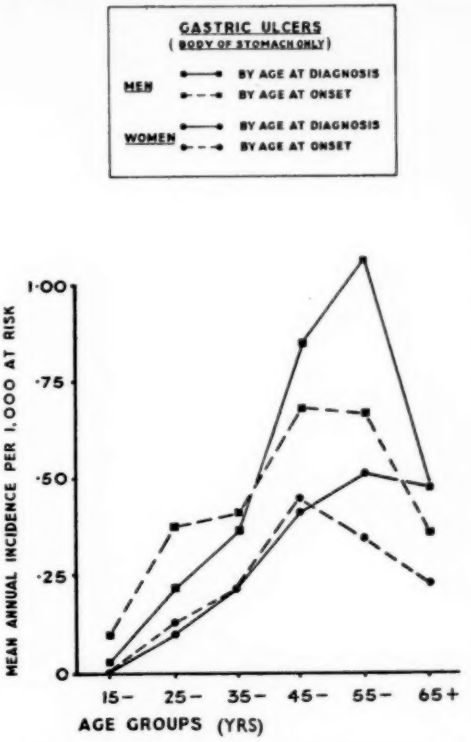

FIG. 3.—Distribution of gastric ulcers (body of stomach only) for the City of York, by sex, age at diagnosis, and age at onset. Patients under 15 at diagnosis are omitted.

To date, it has not been possible to study the influence of specific occupations, but the overall incidence for different social groups (General Register Office, 1956) gives results similar to those reported by Doll and others (Table VII).

TABLE VII

MEAN ANNUAL INCIDENCE PER 1,000 AT RISK BY SOCIAL CLASS

Type of Ulcer	Social Class		
	I and II Professional and Semi-professional	III Skilled	IV and V Semi-skilled and Unskilled
Duodenal	2·08	2·26	3·13
Gastric*	0·34 (0·30)	0·60 (0·48)	0·92 (0·78)

* The figures in brackets for gastric ulcers are for ulcers of the body of the stomach only.

Gastric ulcers are significantly more common in the semi-skilled and unskilled workers than in the skilled artisans ($p < \cdot 02$) or professional and semi-professional classes ($p < \cdot 01$). The York figures, however, suggest that duodenal ulcers showed a similar trend, the differences between the semi-skilled and unskilled workers on the one hand and the higher social classes on the other being significant ($p < \cdot 01$).

The country area is too small to consider in the various social orders; comparison is, therefore, confined to agricultural (Order 11, Sub-order 1) and all "other" occupations. The proportion of "other" to agricultural occupations is appreciably higher in the lower age groups (15 to 34 years = 1·8 : 1) than in the older age groups (55 years and over = 1·2 : 1); for this reason, direct comparison is confined to men aged 35 and over. It has, moreover, to be limited to part of the country area (Rural Districts of Easingwold and Pocklington), as the age

distribution and occupation figures are not available for the rest of the area; this results in the rates appearing slightly higher than those shown in Fig. 1. For this area and age group, the mean annual incidence rates of duodenal ulcer per thousand at risk are almost identical:

Agricultural Work	1·99
All Other Occupations	2·05

Comparison of Incidence in York with that in Other Parts of Great Britain

It is notoriously difficult to compare clinical estimates of ulcer incidence with autopsy findings, and even with other clinical estimates, as the methods of study and reporting vary from centre to centre. Certain limited comparisons are, however, possible.

(*a*) *Acute Perforation in Glasgow, Aberdeen, and York*

The total perforation rate (old and new patients, gastric and duodenal ulcers) for the City of York, 1952–1953, can be compared with the figures for the same years in Glasgow given by Jamieson (1955). The annual rates per 100,000 population were:

City	Men	Women
Glasgow	32·6	3·2
York	26·6	2·8

It would appear that acute perforations in men and women were rather more common in Glasgow than in York.

Weir (1958), studying acute perforated ulcers in Aberdeen for the years 1946–57, found the average yearly incidence for duodenal ulcers in men to be 0·86 per 1,000 men aged 15 and over, which is about twice the rate of 0·41 in York for the years 1952–57. Perforated gastric ulcers in men were, however, less common in Aberdeen than in York.

The method of recording in Aberdeen and York may differ, in that an ulcer near the pylorus might be regarded as duodenal in Aberdeen and as prepyloric gastric in York. If, however, all those recorded as prepyloric in York are considered as duodenal, the difference, though slightly smaller, still exists.

(*b*) *Autopsy Findings in Leeds*

Watkinson (1958a), in his National Autopsy Survey for the years 1955 to 1956, found that duodenal ulcers in men were slightly more common in York (7·4 per cent. active and healed ulcers) than in Leeds (6·3 per cent.), the figures being corrected for age distribution. On the other hand, gastric ulcers were more common in Leeds (3·9 per cent.) than in York (2·3 per cent.).

Watkinson (1958b) also analysed the records of 12,640 autopsies performed in Leeds between 1930 and 1949.

Fig. 4 (opposite) shows for Leeds the rates for active chronic ulcers found incidentally at autopsy, excluding ulcer deaths, probably the best estimate of incidence in the general population. For York, Fig. 4 shows the rates for new cases diagnosed clinically. Patients with both duodenal and gastric ulcers have been included in both series of rates, and those with antral ulcers have been included in the gastric group.

The rates for York in Fig. 4 therefore differ slightly from those given in Table V and VI and Figs 2 and 3. Bearing in mind that the figures for York represent new cases only, and those for Leeds the total ulcer population, old and new patients, the correlation for duodenal ulcers is good, but gastric ulcers are seen to be appreciably less common in York. This might well represent a failure of diagnosis in York, but it also corresponds with the finding of the National Autopsy Survey. This difference, if confirmed, cannot be explained simply by social class distribution, which is similar in the two cities.

(*c*) *Comparative Incidence in York and in the South of England*

Doll and others (1951), in a social study carried out in the south of England, estimated the annual risk of males aged 10 and over developing a peptic ulcer as 0·207 per cent. A comparative figure for York and District for the years 1952 to 57 is 0·258 per cent.

Such comparisons could well be extended, but these few examples illustrate both similarities and differences in the incidence, further study of which might help in understanding the aetiology of peptic ulcers.

Discussion

It would appear that, even in a small geographical area, there is a real and significant difference in incidence between town and country. There are indications, however, that this difference is disappearing, and already in some rural parishes the incidence is at least as high as in the town.

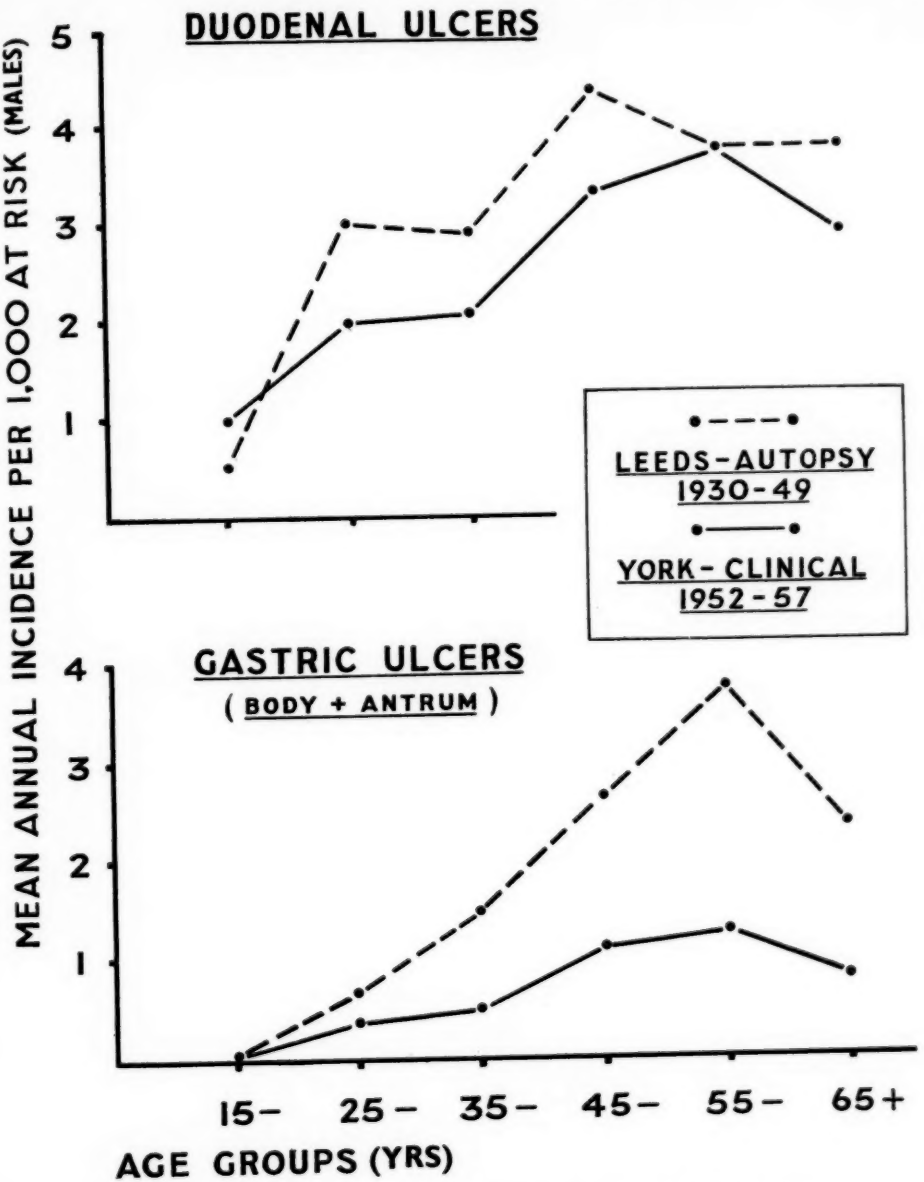

FIG. 4.—Comparative incidence of male duodenal ulcers and all male gastric ulcers in Leeds and York.
The Leeds figures are for chronic active ulcers found incidentally at autopsy, excluding ulcer deaths (Watkinson).
The York figures give a clinical estimate of *new* patients diagnosed in the years 1952–57.
Double active ulcers are included under both duodenal and gastric.

The cause is a matter for speculation, and the simple explanation that it represents the increased stress of urban life is difficult to prove or disprove. It is doubtful, in this instance, if there is any fundamental difference in the tempo of life of the urban and rural communities, since York has a high standard of living and is neither very large nor highly industrialized.

It is possible that certain conditions of work (*e.g.* shift work) or some difference in daily habits (*e.g.* the time of meals, the type of food eaten, or the prevalence of smoking) may act as aggravating factors, leading to a higher incidence in the town. In this connexion, it is noteworthy that in recent years there has been a drift of labour from the land to urban occupations; this has led to the adoption of urban habits, even though the people still live in the country. Time alone will show whether this trend influences the incidence of peptic ulcers in rural districts.

Summary

The incidence of new cases of peptic ulcer has been studied in York and environs for the years 1952 to 1957.

It has been found that in men both gastric and duodenal ulcers are significantly more common in the City of York than in the surrounding countryside. Similar differences have been observed for women, but these are not statistically significant.

Comparisons with other estimates of the incidence of peptic ulcers have yielded the following results:

(1) Acute perforated peptic ulcers in the years 1952–53 were more common in Glasgow than in York.

(2) The rate for male duodenal ulcers in Leeds is similar to that in York, but there are indications that gastric ulcer in men is more common in Leeds than in York.

(3) The estimated annual risk of males aged 10 years and over developing a peptic ulcer in York and district is 0·258 per cent., whereas Doll and others (1951) give a figure of 0·207 per cent. for southern England.

I am very grateful to all my colleagues—in particular to Mr. J. H. Conyers, Mr. R. A. Hall, Mr. J. K. Willson-Pepper, and Dr. D. Laing, whose co-operation made this investigation possible; to the many general practitioners who have referred patients for investigation; to Dr. F. Avery Jones and Dr. Richard Doll for much helpful advice and encouragement; to Dr. Geoffrey Watkinson and Dr. R. D. Weir for allowing me to quote unpublished figures; to Mrs. R. Nicolson for careful record keeping, and to the York Peptic Ulcer Research Trust for financial assistance.

REFERENCES

Alsted, G. (1953). "Peptic Ulcer in Denmark, Copenhagen, 1953". *Lancet*, **2**, 444 (Annotation).
Bager, B. (1929). *Acta chir. scand.*, **64**, Suppl. 11.
Dogra, J. R. (1940). *Indian J. med. Res.*, **28**, 145.
Doll, R., Jones, F. A., and Buckatzsch, M. (1951). *Spec. Rep. Ser. med. Res. Coun. Lond.*, No. 276. H.M.S.O., London.
General Register Office (1956). "Census 1951. Classification of Occupations". H.M.S.O., London.
Ginanneschi, G. (1938). *Med d. Lavoro*, **29**, 65.
Jamieson, R. A. (1955). *Brit. med. J.*, **2**, 222.
Konstam, P. G. (1954). *Lancet*, **2**, 1039.
Morris, J. N., and Titmuss, R. M. (1944). *Ibid.*, **2**, 841.
Watkinson G. (1958a). *Schweiz. Z. allg. Path.*, **21**, 405.
——(1958b). Personal communication.
Weir, R. D. (1958). Personal communication.

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INFLUENCE OF SOME METEOROLOGICAL FACTORS IN THE INCIDENCE OF POLIOMYELITIS

BY

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The seasonal variation in the incidence of poliomyelitis in temperate climates is one of the most obvious characteristics of the disease. A number of explanations of this have been put forward, for example by Aycock (1930), Petersen (1941), and Armstrong (1950). These explanations are mainly based on association in the average monthly trends and this approach is suspect statistically since it would almost always be possible to find some factor, meteorological or otherwise, with a similar seasonal distribution to poliomyelitis but with no necessary causal relation to the disease. Armstrong (1950), for example, shews that the seasonal variation in absolute humidity is closely parallel to that of poliomyelitis in eastern North America and goes on to produce an ingenious physiological explanation of why this should be so. Petersen (1941), by a similar type of argument, suggests solar radiation as the effective agent. Bradley and Richmond (1953), on the other hand, from a study of the English experience from 1947-50, have concluded that there is no obvious relationship between the incidence of the disease and the dry bulb temperature and absolute humidity.

Lawrence (1956) showed that there was a strong positive correlation between the total yearly notifications and the yearly mean dry bulb temperatures in the period 1947-52, and also between temperature and maximum weekly notifications. However, he also quotes some unpublished studies by the Meteorological Office which demonstrated little correlation between poliomyelitis incidence and temperature or relative humidity.

The present paper sets out to apply a statistical method which avoids some of the obvious pitfalls that beset the comparison of seasonal trends. It also allows an estimate to be made of how far the effect of associated meteorological variables is able to account for the actual range of variation of the incidence of the disease.

Materials and Methods

The basic information used in the present study was derived from the Registrar General's uncorrected weekly notifications of poliomyelitis, and from the Meteorological Office records. The calendar month was taken as the unit of time as this was convenient in abstracting records and sufficiently long to smooth out some of the minor irregularities of weekly reporting. It is somewhat inconvenient in being irregular in length, but if this is ignored the effect on the results is negligible.

Before analysis the monthly poliomyelitis figures were converted to logarithms to the base 10. This step was taken to even out the variability from one part of the year to another. There are great variations in the monthly incidence of poliomyelitis and changes in the absolute number of cases in midsummer are often large compared with those in the winter though the relative changes are of the same order.

The investigation was begun using the meteorological data collected by Bradley and Richmond (1953) and supplied by Captain F. H. Bradley of the Ministry of Health. When the analysis was extended up to 1956 the relevant figures were extracted from the Meteorological Office records at Harrow by permission of the Director. The final figures used are monthly averages of four daily readings taken at London Airport, Plymouth, Tynemouth, and Manchester, the temperature is in degrees Fahrenheit, and vapour pressure in millibars.

Bradley and Richmond (1953) confined their investigation to the effects of dry bulb temperature and absolute vapour pressure but the present study includes also the relative humidity obtained roughly from a graph of the relation between saturation vapour pressure and temperature plotted from figures given by Penman (1955).

The statistical methods used were largely suggested by the examples and discussion given in Chapter II

of Quenouille (1952). In most time series analyses it is usual to remove the seasonal and long-term trends in the variables whose interrelations are being investigated and to base the conclusions on associations between the residual deviations from these fitted trends. What method of trend elimination is used is to some extent a matter of convenience. The method used here was to remove the average effect of months and years by the usual analysis of variance technique of fitting constants. This approach was particularly convenient for the machine computations, as the computer programme used prints out the residuals, after fitting the constants, which can then be used for correlation studies.

An alternative method would have been to fit trigonometrical regressions to the monthly values of the variables (Bliss, 1958; Aitken, 1939) and to correlate the deviations from these. However, it was found for poliomyelitis that there were significant variations from year to year in both amplitude and phase of a fitted Fourier series, and that more than two harmonics were required for an adequate fit; so, for simplicity, the method of fitting constants was used to provide the residuals.

Most of the computing was done on the Elliott 401 Mk I digital computer at Rothamsted Experimental Station. Mr. R. H. Tizard kindly provided a programme with which serial correlations were computed on the English Electric "Deuce" machine.

The analysis was based mainly on Table I (opposite), which shews the log mean weekly incidence of poliomyelitis (paralytic and non-paralytic) in England and Wales by calendar months for the years 1947-1956, together with the corresponding values of dry bulb temperature in degrees Fahrenheit, absolute vapour pressure in millibars, and relative humidity. The log poliomyelitis incidence was analysed not only in relation to the corresponding month's meteorological variables but also in relation to those of the two previous months. For this purpose extra values of the meteorological factors, outside the range of Table I, were extracted from the records. The variances and co-variances between the residuals of these variables after removal of yearly and monthly trends are given in Table II, which is, in effect, the "error" line of a table of the analysis of co-variance with 99 degrees of freedom.

Results

The results of the regression analysis of the residuals are summarized in Table III. This gives the coefficients of the multiple linear regression of poliomyelitis residuals on the temperature and the relative humidity residuals of the same month and the two preceding months, together with their standard errors.

Table III

COEFFICIENTS OF MULTIPLE REGRESSION OF LOG POLIOMYELITIS RESIDUALS ON RESIDUALS OF TEMPERATURE ($b_1 - b_3$) AND RELATIVE HUMIDITY ($b_4 - b_6$) IN SAME AND TWO PREVIOUS MONTHS

		Coefficients of Multiple Regression	
Temperature	In same month	b_1	$+0{\cdot}017 \pm 0{\cdot}008$
	In previous month	b_2	$+0{\cdot}025 \pm 0{\cdot}008$
	In next previous month	b_3	$+0{\cdot}012 \pm 0{\cdot}008$
Relative Humidity	In same month	b_4	$-0{\cdot}015 \pm 0{\cdot}006$
	In previous month	b_5	$-0{\cdot}009 \pm 0{\cdot}006$
	In next previous month	b_6	$-0{\cdot}007 \pm 0{\cdot}006$

Table IV (opposite) gives the corresponding analysis of variance showing that about 36 per cent. of the variation in the poliomyelitis residuals can be accounted for by its association with the meteorological variables.

The absolute vapour pressure has been omitted from this regression as a preliminary analysis showed that it was of comparatively small importance. For example, the second order partial correlation between poliomyelitis incidence and the absolute vapour pressure, after eliminating the current month's relative humidity and the previous month's temperature, was 0·1915, which is not statistically significant

Table II

VARIANCES AND CO-VARIANCES OF LOG POLIOMYELITIS RESIDUALS AND TEMPERATURE AND RELATIVE HUMIDITY IN THE SAME AND TWO PREVIOUS MONTHS

Variable	Log Poliomyelitis Incidence	Temperature			Relative Humidity		
		In same month	In previous month	In next previous month	In same month	In previous month	In next previous month
	P	t_0	t_1	t_2	r_0	r_1	r_2
P	4·0936						
t_0		15·569					
t_1		534·78	21·671				
t_2			177·18	16·588			
r_0			541·99	76·06	−19·27		
r_1				160·34	−82·6	−12·97	
r_2				527·98	−14·23	−24·1	−7·27
					−180·9	−87·3	39·50
					762·0	−146·5	−16·9
						77·0	−104·6
						755·0	28·0
							95·0
							804·0

TABLE I

MEAN WEEKLY LOG POLIOMYELITIS INCIDENCE (P), MEAN DRY BULB TEMPERATURE (°F.) (T), MEAN RELATIVE HUMIDITY (RH), AND MEAN VAPOUR PRESSURE (MILLIBARS) (VP), BY MONTHS, 1947–1956

Year		1947	1948	1949	1950	1951	1952	1953	1954	1955	1956	Total
January	P	1·04	1·71	1·40	1·72	1·56	1·48	1·48	1·56	1·36	1·66	14·97
	T	37·6	42·3	42·5	41·4	40·6	38·4	40·0	38·8	38·7	39·8	400·1
	RH	86	86	85	89	87	84	87	81	86	87	858
	VP	6·7	7·9	7·9	7·9	7·6	6·7	7·4	6·7	7·0	7·4	73·2
February	P	1·05	1·47	1·19	1·57	1·37	1·25	1·32	1·33	1·18	1·35	13·08
	T	30·5	41·1	43·1	42·8	38·5	39·0	40·5	38·1	35·8	33·4	382·8
	RH	88	88	80	83	86	81	84	85	82	81	838
	VP	5·1	7·4	7·7	7·9	7·0	6·6	7·3	6·8	6·0	5·4	67·2
March	P	0·81	1·31	1·22	1·47	1·25	1·26	1·44	1·32	1·04	1·20	12·32
	T	39·5	47·0	42·1	45·2	40·4	44·5	42·9	43·1	38·6	43·5	426·8
	RH	87	77	85	81	82	85	76	82	74	79	808
	VP	7·3	8·6	7·8	8·4	7·0	8·6	7·2	7·8	6·0	7·6	76·3
April	P	0·94	1·23	1·06	1·35	1·28	1·35	1·56	1·17	1·10	1·23	12·27
	T	47·6	48·5	49·8	45·9	44·8	48·6	45·7	46·3	47·4	44·6	469·2
	RH	76	75	77	75	71	77	75	72	77	75	750
	VP	8·7	8·8	9·5	8·1	7·3	9·0	7·9	7·6	9·0	7·5	83·4
May	P	1·16	1·28	1·16	1·50	1·40	1·53	1·59	1·34	1·34	1·48	13·78
	T	54·2	52·4	51·8	52·6	49·5	54·9	54·3	51·7	49·4	53·5	524·3
	RH	78	72	74	77	75	75	74	78	76	72	751
	VP	11·4	9·9	9·9	10·5	9·2	11·2	10·9	10·2	9·1	9·9	102·2
June	P	1·66	1·36	1·61	2·04	1·81	1·83	1·84	1·59	1·66	1·78	17·18
	T	58·4	55·9	58·4	60·0	55·5	57·5	56·8	55·7	56·5	55·2	569·9
	RH	79	80	74	76	76	74	83	80	78	78	778
	VP	13·2	12·4	12·5	13·6	11·5	12·0	13·2	12·1	12·1	11·6	124·2
July	P	2·38	1·57	2·06	2·40	2·07	2·24	2·34	1·88	2·20	2·12	21·26
	T	61·2	59·5	63·1	60·7	61·3	61·8	59·6	57·2	63·2	59·7	607·3
	RH	82	80	73	80	75	74	79	80	75	81	779
	VP	15·2	14·0	14·5	14·6	14·1	14·3	13·8	12·7	14·7	14·1	142·0
August	P	2·81	1·78	2·42	2·69	2·05	2·37	2·44	1·93	2·55	2·16	23·20
	T	64·5	58·8	62·0	59·7	58·7	60·0	60·6	57·7	64·0	56·4	602·4
	RH	74	84	77	82	79	79	79	84	77	83	798
	VP	15·5	14·2	14·7	14·4	13·5	14·1	14·3	13·7	15·5	12·7	142·6
September	P	2·76	1·88	2·51	2·64	1·97	2·25	2·31	1·91	2·61	2·06	22·90
	T	58·9	57·1	61·4	55·7	57·9	53·1	56·9	55·1	57·8	57·7	571·6
	RH	79	81	82	83	82	76	83	81	79	86	812
	VP	13·4	13·1	15·4	12·7	13·5	10·7	13·2	12·0	12·9	14·0	130·9
October	P	2·50	1·91	2·60	2·46	2·00	2·05	2·15	1·84	2·54	2·14	22·19
	T	52·4	50·7	54·6	50·3	50·6	48·3	50·2	53·9	49·2	50·0	510·2
	RH	81	84	83	86	83	84	87	86	81	84	839
	VP	11·1	10·8	12·3	10·8	10·5	9·8	10·8	12·3	9·8	10·5	108·7
November	P	2·22	1·77	2·39	2·22	1·82	1·97	1·94	1·75	2·28	1·98	20·34
	T	45·8	46·4	45·7	43·1	48·7	40·9	47·9	45·7	46·0	44·3	454·5
	RH	86	90	81	87	85	85	87	85	84	84	854
	VP	9·2	9·8	8·7	8·4	10·0	7·4	10·0	9·1	9·1	8·4	90·1
December	P	1·82	1·49	2·00	1·91	1·56	1·68	1·70	1·47	1·95	1·82	17·40
	T	43·4	43·4	44·0	35·8	43·3	39·2	46·6	45·0	44·1	44·0	428·8
	RH	85	86	82	86	85	86	87	84	85	88	854
	VP	8·3	8·4	8·2	6·3	8·3	7·1	9·5	8·7	8·5	8·8	82·1
Total	P	21·15	18·76	21·62	23·97	20·14	21·26	22·11	19·09	21·81	20·98	210·89
	T	594·0	603·1	618·5	593·2	589·8	586·2	602·0	588·3	590·7	582·1	5947·9
	RH	981	983	953	985	966	960	981	978	954	978	9719
	VP	125·1	125·3	129·1	123·6	119·5	117·5	125·5	119·7	119·7	117·9	1222·9

TABLE IV

ANALYSIS OF VARIANCE SHOWING VARIATION IN LOG POLIOMYELITIS RESIDUALS ASCRIBABLE TO TEMPERATURE AND RELATIVE HUMIDITY IN SAME AND TWO PREVIOUS MONTHS ($R^2 = 0{\cdot}3644$)

Source of Variation	Sum of Squares	Degrees of Freedom	Mean Squares
Regression on Temperature and Relative Humidity ..	1·4721	6	0·2453
Residual	2·5675	93	0·0276
Total	4·0396		

on 96 degrees of freedom. The two variables eliminated are those most strongly correlated with poliomyelitis incidence and the introduction of others reduces the value of the correlation with vapour pressure still further.

It can be seen from Table III that, as judged by their standard errors, only the regression coefficients of poliomyelitis incidence on the current and previous months' temperature and the current month's

relative humidity are statistically significant. However, the other three coefficients all exceed their standard errors and can be shown to contribute significantly in aggregate to the sum of squares for regression, so that some, at least, of the six variables appear to influence the current month's poliomyelitis. The effect of temperature and relative humidity more than two months before is negligible—incorporation of the third month only removes 0·01 from the sum of squares for poliomyelitis incidence, compared with a residual error of 0·03.

The regression coefficients of poliomyelitis incidence on temperature and relative humidity given above were derived from the simultaneous variation in the residuals of these quantities after the main effects of years and seasons had been allowed for. It is interesting to see how far this regression can account for the seasonal variation. If the seasonal swing is due mainly to factors unconnected with temperature and relative humidity, then there is no reason to expect that the average seasonal incidence of poliomyelitis could be predicted from concomitant variation of poliomyelitis incidence and these two variables.

While it is possible that there might be a general similarity in the relative monthly incidence, it is nevertheless unlikely that the full range of seasonal variation would be predicted, or that there should be a close coincidence of the maxima of the two curves. To take a hypothetical example, a disease whose spread was favoured to some extent by cold weather, but which was largely disseminated in ice-cream, would show a high summer incidence quite unpredictable from its observed relation to meteorological factors over short periods of time throughout the year.

Expected values of the log poliomyelitis incidence in any given month can be derived using the regression coefficients given in Table III and the deviations about their general mean of the corresponding meteorological variables. The multiple regression equation is used in the form

$$p = \bar{p} + b_1(t_0 - \bar{t}) + b_2(t_1 - \bar{t}) + \ldots + b_4(r_0 - \bar{r}) + \ldots \text{etc.}$$

where $\bar{p}$ is the mean poliomyelitis incidence, $\bar{t}$ the mean temperature, and $\bar{r}$ the mean relative humidity over the whole period of observation, $t_0, t_1 \ldots, r_0, r_1 \ldots$ etc. are the observed temperatures and relative humidities in the relevant months, and $b_1, b_2 \ldots$ etc. have the values given in Table III.

The results of such a calculation are given in the Figure, which compares the average monthly incidence of poliomyelitis in the years 1947-56 with

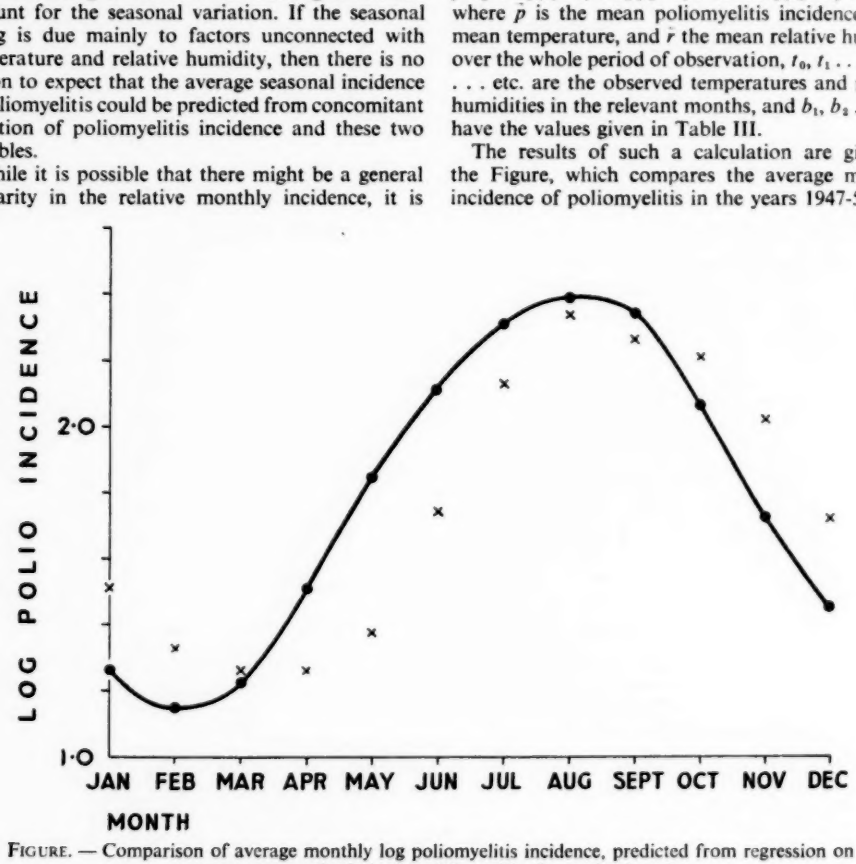

FIGURE. — Comparison of average monthly log poliomyelitis incidence, predicted from regression on temperature and relative humidity, with observed values (x).

that calculated from the monthly mean regression on temperatures and relative humidities, using the residual regression coefficients. It can be seen that there is a fair measure of agreement between the observed and calculated incidence. The range of the predicted curve is very close to the observed value and the position of the summer maximum coincides fairly well. On the other hand, the predicted minimum occurs considerably before the actual one, and the curve as a whole tends to be too high in the early part of the epidemic and too low in the latter part. The general nature of the discrepancy is not unexpected, since the disease tends to be under-notified in the early stages of the epidemic and over-notified later on when many cases are being reported. In addition, the epidemic must take on a momentum of its own, independent of meteorological factors, once it is well launched, and this will cause an excess of cases in the later stages and a corresponding deficit of cases at the beginning of the next seasonal rise due to exhaustion of the susceptible population.

The analysis presented so far applies to the whole period from 1947-1956. It is usual in studies with time series to repeat the analysis, as far as possible, separately for subsections of the series. This provides a check on the consistency of the analysis and is particularly important in a case like the present. The incidence of the disease in England and Wales is now much higher than before 1939, and may well have taken some time to reach equilibrium after the sudden change in incidence that occurred in 1947. Examination of the series does in fact show that the relation between poliomyelitis and meteorological variables is not constant from year to year. This is illustrated in Table V, where it can be seen that the relationship with temperature was very weak in the years 1949-1951, and also in 1953. One of the effects of this irregularity is that the results for paralytic poliomyelitis, for which figures are available only from 1950 onwards, show no significant correlation with temperature or humidity. This occurs largely because they do not include the very high correlations found in 1947 and 1948, and similar considerations apply to notifications of non-paralytic poliomyelitis over the same period.

TABLE V

CORRELATION COEFFICIENTS BETWEEN POLIOMYELITIS RESIDUALS AND PREVIOUS MONTH'S TEMPERATURE, 1947–1956

Year	r
1947	+ 0·787
1948	+ 0·802
1949	+ 0·364
1950	+ 0·049
1951	− 0·495
1952	+ 0·850
1953	+ 0·142
1954	+ 0·518
1955	+ 0·554
1956	+ 0·459

DISCUSSION

The results reported above establish a *prima facie* case for a relationship between the incidence of poliomyelitis, temperature and relative humidity but provide no evidence that absolute vapour pressure is of much importance, in contradiction to the hypothesis of Armstrong (1950) regarding the nature of the relationship between incidence of the disease and climatic factors. On the other hand, the analysis does not exclude the possibility that other meteorological variables closely related to temperature and relative humidity are involved.

Generally speaking, the meteorological conditions favouring spread of the disease are those of rapid outdoor drying, though there does not seem to be any simple explanation of the fact that incidence of the disease is associated with meteorological conditions up to 2 months previously. As the regression coefficients calculated from the comparatively small scale monthly deviations are capable of explaining the yearly range of variation, it seems likely that the seasonal association with temperature is not related only to the greater physical activity and freer mixing of the population that occurs in the summer months. A possible hypothesis is that atmospheric conditions of rapid drying favour survival of the virus in faeces, and one suggestion that arises from the present study is that this should be put to experimental test.

The statistical validity of the analysis is by no means beyond question. The main point in its favour is that the regression coefficients calculated from the residuals are capable of explaining the range of seasonal variation in the incidence of the disease and the position of the maximum. The deviations from prediction are such as might be expected to occur on other grounds, though there is no method of assessing how large the expected deviations should be.

The main statistical weaknesses are the variations in the strength of the relationship between poliomyelitis incidence and meteorological factors from year to year, which arise through ignoring interactions in the analysis of co-variance, and through the presence of considerable serial correlations in the residuals. The latter can to some extent be allowed for by statistical methods, their effect being to reduce the apparent number of observations by a factor depending in the strength of the correlations. Using the method given by Quenouille (1952), it was

found that the effective number of degrees of freedom were reduced by about 50 per cent., which is not sufficient to destroy the formal significance of the correlation between poliomyelitis incidence, temperature, and relative humidity.

The general pattern of the variation from year to year in the correlations between meteorological factors and poliomyelitis is illustrated in Table V, which shows the correlation coefficients between the residuals of poliomyelitis and previous month's temperature, calculated separately for each year. It is obvious that the relationship is not stable, and a z-test reveals that there are significant variations in the coefficients. The correlations are all positive, except in 1951, and mostly of reasonable size; this supports the existence of a positive relationship, but it seems probable that the strength and nature of this association are not the same from year to year. However, the ability of the regression equation to account for the mean seasonal variation of the disease over a 10-year period suggests that there may be a stable underlying relationship. For further corroboration it would be interesting to extend this work in future years and also to make similar investigations on other countries with a greater range of yearly variation in the meteorological factors under consideration.

Summary

An analysis has been made of the relationship between the incidence of poliomyelitis in England and Wales from 1947 to 1956 and various meteorological factors.

It was found that there were strong positive correlations with dry bulb temperature and negative correlations with relative humidity, but that absolute vapour pressure was not related to the incidence of poliomyelitis. The calculated relationship with temperature and relative humidity was able to account for the main seasonal range and also for the time of the maximum incidence.

The results and methods of analysis are critically discussed.

I am greatly indebted to the Statistics Department at Rothamsted Experimental Station and particularly to Mr. M. J. R. Healy for help in analysing much of the data on the electronic computer there. I am also grateful to Mr. R. H. Tizard and Miss J. Grahame for calculating serial correlations on the English Electric Deuce machine. Mr. R. G. Veryard and Mr. E. N. Lawrence of the Air Ministry Meteorological Office, Harrow, have allowed me to make use of the records there and were most helpful in abstracting them. Captain F. H. Bradley of the Ministry of Health kindly supplied me with the figures for 1947-52. Finally, I must thank Miss Molly Fretton who has assisted me throughout with the calculations and the abstracting of records.

References

Aitken, A. C. (1939). "Statistical Mathematics", 1st ed. Oliver and Boyd, Edinburgh.
Armstrong, C. (1950). *Amer. J. publ. Hlth*, **40**, 1296.
Aycock, W. L. (1930). *Ibid.*, **20**, 41.
Bliss, C. I. (1958). *Bull. Conn. agric. Exp. Sta.*, No. 615.
Bradley, W. H., and Richmond, A. E. (1953). *Monthly Bull. Minist. Hlth Lab. Serv.*, **12**, 2.
Lawrence, E. N. (1956). *Met. Mag. Lond.*, **85**, 164.
Penman, H. L. (1955). "Humidity". Institute of Physics, London.
Petersen, H. (1941). *Acta med. scand.*, **107**, 282.
Quenouille, M. H. (1952). "Associated Measurements". Butterworth, London.

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DURATION OF STAY IN HOSPITAL OF PATIENTS SUFFERING FROM SCHIZOPHRENIA

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During recent years many changes in methods of treatment and in administrative policies have been introduced into mental hospitals. There has been a more intensive use of the physical treatments, culminating in the present preoccupation with the ataraxic drugs. Parallel with this has been the development of habit-training methods, group psychotherapy, the "open door" policy, and the therapeutic community. Finally, discharge policy has been altered, in conjunction with the attempt to minimize the barrier between the hospital and the outside world. At any hospital where this ferment of change has been taking place for a number of years, it should be possible to demonstrate a resulting decrease in the length of stay, and an improvement in the clinical and social status, of patients who formerly would have been regarded as having a poor prognosis. In particular, schizophrenic patients should be shown to have benefited. As part of a programme of work designed to investigate this assumption, the present authors have made a study of two cohorts of schizophrenic patients admitted to Long Grove Hospital.

This hospital is situated in Epsom, Surrey, and is thus about 25 miles away from its catchment area, the East End of London. The composition of the area has not changed during the period under review. It is predominantly working class and some of its social characteristics have been investigated in recent work by the Institute of Community Studies (Young and Willmott, 1957). The hospital has about 2,000 beds.

The first cohort studied consisted of patients admitted between July 1, 1950, and June 30, 1951; these patients were followed up, using hospital records, for 5 years. The second cohort consisted of patients admitted between July 1, 1955, and June 30, 1956, with a follow-up period of 2 years.

The only comparable study of a single English mental hospital is that made by Shepherd (1957). He compared a cohort of patients admitted during 1931–1933 with a cohort admitted in 1945–47, using a 5-year follow-up period. There was a slight increase (from 29 to 37 per cent.) in the proportion of first-admission schizophrenic patients retained continuously for 5 years in the later cohort, but a decrease (from 73 to 40 per cent.) in the proportion of re-admitted patients so retained. The numbers of schizophrenic patients involved were, however, small.

Kramer, Goldstein, Israel, and Johnson (1955) showed that a larger proportion of patients with functional psychoses (about 75 per cent.) was discharged from the Warren State Hospital in the 2 years after first admission during the period 1946–1950 than at any previous time since 1916, although they were unwilling to state that this was due to the increased use of E.C.T. and insulin coma treatment. Malzberg (1952), investigating the New York State figures, found that about one-half of first-admission schizophrenics were retained continuously for 2 years.

Svendsen (1952) and Kramer and others (1955) have discussed the many factors which may influence admission and discharge from hospital. Important among these is the attitude taken by members of the community which the hospital serves. This was illustrated by Harris and Norris (1954), who found that the admission of patients with milder illnesses following the Mental Treatment Act of 1930 partly accounted for an apparent improvement in prognosis. Since marital status and social class have

been found to be associated with prognosis in schizophrenia (Ødegård, 1946; Norris, 1956; Brooke, 1957), any alteration in these respects due to change in the way the hospital is regarded may markedly affect the outcome. The education of public attitudes has been undertaken by Macmillan (1958) and Carse (1958) as part of their development of community services. Macmillan states that no schizophrenic patient first admitted during 1956 was resident in his hospital 2 years later, and he considers that this is largely due to the fact that he can supervise patients in their own homes both before and after their hospital stay. However, other factors are no doubt important, in particular new methods of treatment and a more outward-looking discharge policy.

Results of Present Study

The composition of the two cohorts in terms of age, sex, marital status, occupation (men only), and previous admission to any hospital for mental illness is shown in Table I. None of the differences between the cohorts reaches significance, using the χ^2 test, though the increase in male readmissions approaches it ($\chi^2 = 3{\cdot}3$; $n = 1$; $p = <0{\cdot}10$).*

Table II shows the numbers of patients who were discharged from hospital within 2 years of admission. There was a significant increase (using the χ^2 test) in the proportions of males and of re-admitted females so discharged, but no change in respect of females admitted for the first time.

The extent to which patients who were discharged within 2 years of admission were subsequently re-admitted during the 2-year follow-up period is shown in Table III (opposite). There is no significant change in the proportion readmitted in any category.

The mean length of stay in hospital during the 2-year follow-up period (including periods of re-admission) is presented separately for the two cohorts, two sexes, and two age groups in Table IV (opposite).

Parametric statistics are not well suited to this type of distribution, but the means shown enable a rough

* Yates's correction for continuity was used in calculating χ^2 when the expected frequency in any cell was less than 10.

TABLE I

PATIENTS SUFFERING FROM SCHIZOPHRENIA ADMITTED TO LONG GROVE HOSPITAL IN THE TWO TWELVE-MONTH PERIODS 1.7.50 TO 30.6.51 AND 1.7.55 TO 30.6.56

Admissions to Hospital with Diagnosis of Schizophrenia		Males				Females			
		1950–51		1955–56		1950–51		1955–56	
		No.	Per cent.	No.	Per cent.	No.	Per cent.	No.	Per cent.
Total Patients		80	100	123	100	82	100	75	100
Age (yrs)	Under 35	42	52·5	64	52·0	49	59·8	32	42·7
	35 and Over	38	47·5	59	48·0	33	40·2	43	57·3
Marital Status	Ever married	22	27·5	39	31·7	39	47·6	38	50·7
	Single	58	72·5	84	68·3	43	52·4	37	49·3
Previous Admissions	None	41	51·3	46	37·4	29	35·4	19	25·3
	One or More	39	48·8	77	62·6	53	64·6	56	74·7
Previous Occupations	Semi-skilled or Skilled	35	43·8	42	34·1	—	—	—	—
	Unskilled or None	37	46·3	65	52·8	—	—	—	—
	Other	8	10·0	16	13·1	—	—	—	—

TABLE II

NUMBER OF PATIENTS DISCHARGED AND REMAINING IN HOSPITAL DURING THE 2 YEARS AFTER ADMISSION

Progress within 2 Years of Admission	Males				Females			
	First Admission		Re-admission		First Admission		Re-admission	
	1950	1955	1950	1955	1950	1955	1950	1955
Total Patients	41	46	39	77	29	19	53	56
Discharged	28	43	23	60	22	14	27	41
Remained Continuously	13	3	16	17	7	5	26	15
Proportion Per cent. Discharged	68·3	93·5	59·0	77·9	75·9	73·7	50·9	73·2

TABLE III

RE-ADMISSIONS TO HOSPITAL AFTER DISCHARGE WITHIN 2 YEARS OF FIRST ADMISSION

Subsequent Progress of Patients discharged within 2 Years of First Admission	Males				Females			
	First Admission		Re-admission		First Admission		Re-admission	
	1950	1955	1950	1955	1950	1955	1950	1955
Total Patients Discharged	28	43	23	60	22	14	27	41
Not Re-admitted	20	39	18	44	10	11	19	27
Re-admitted	8	4	5	16	12	3	8	14
Proportion Per cent. Re-admitted	28·6	9·3	21·7	26·7	54·5	21·4	29·6	34·1

TABLE IV

MEAN DURATION OF STAY IN HOSPITAL DURING THE 2 YEARS FOLLOWING ADMISSION (MONTHS)

Age (yrs)	Males		Females	
	1950	1955	1950	1955
Under 35	12·5	7·7	12·9	11·0
35 and Over	15·0	9·3	15·2	13·6

comparison to be made between the various groups. The decrease in total time spent in hospital is consistent for all subgroups, but it is clear that the older patients tend to stay longer.

It has already been shown (*cf.* Table I) that the social class and marital status composition of the cohorts was not significantly different. There has been a trend towards the admission of voluntary rather than certified patients in 1955 compared with 1950 (39 per cent. compared with 30 per cent. voluntary) but this was not significant statistically ($\chi^2 = 3{\cdot}1$; $p = >0{\cdot}05$).

Patients who were single on admission had a worse prognosis in both cohorts when age was taken into account, but there was a significant improvement in the second cohort as compared with the first. The relationships are shown in Table V.

TABLE V

PROPORTION OF PATIENTS REMAINING CONTINUOUSLY IN HOSPITAL FOR AT LEAST 2 YEARS, BY AGE AND MARITAL STATUS

Age (yrs)	Marital Status	Per cent. remained 2 Years or More	
		1950	1955
Under 35	Single	31	14
	Married	23	11
35 and Over	Single	57	33
	Married	38	22

On the other hand, patients whose previous occupations had been unskilled (the Registrar General's Social Class V) did not have a worse prognosis than others (for the first cohort, $\chi^2 = 2{\cdot}73$; $n = 1$; $p = >0{\cdot}05$). The prognosis for unskilled labourers taken alone improved significantly ($\chi^2 = 7{\cdot}43$: $n = 1$; $p = < 0{\cdot}01$).

The subsequent history of the sixty patients of the 1950 cohort who remained in hospital continuously for 2 years was that 68 per cent. continued to be resident throughout the next 3 years, only nineteen being discharged during this time.

DISCUSSION

The figures quoted above appear to show that Long Grove Hospital exemplifies current British mental hospital practice to the extent that schizophrenic patients are being discharged significantly earlier, but also that the patients so discharged are not more frequently readmitted than before. Various explanations may be put forward.

In the first place, it is suggested that community attitudes have altered, in respect both of the illness and of the mental hospital as a proper place of treatment. This process has been helped by the opening of new out-patient clinics where contact with the patient and his family is maintained and admission to hospital arranged in a co-operative rather than a coercive way. However, the difficulties caused by the distance between hospital and catchment area are too great for a satisfactory community service to be developed, and deliberate fragmentation of what used to be a continuous stay is not practicable. No evidence can be shown that a milder type of illness characterized the second cohort studied, nor is the re-admission rate raised. There is no reason to suppose that there have been increased re-admissions to other hospitals. It must be concluded, therefore, that change of community attitudes has not contributed greatly to the improvement that has taken place.

Two main factors remain for consideration: changes in treatment, affecting the actual clinical state of the patients, and changes in discharge

policy, affecting patients who formerly would not have been considered for discharge.

Between 1950 and 1955, a number of changes occurred of a more or less deliberate and controlled kind. A new Physician Superintendent had been appointed in 1951, the nursing services were re-organized, and enlarged, increased and more efficient use was made of E.C.T., insulin coma, and leucotomy, and a more outward-looking discharge policy was adopted. Social work was also more emphasized, though the tiny establishment of psychiatric social workers made improvement in this field very difficult. During the past two years Chlorpromazine, Reserpine, and other drugs have been used on a large scale, and methods of group treatment have been introduced. Drug treatment of outpatients may have had an effect in keeping down re-admissions during the second follow-up period. It is difficult not to attribute some of the improvement to alterations in clinical practice. However, questions of this kind can be decided only by specific on-going studies.

So far as discharge policy is concerned, there has undoubtedly been a major change. G. W. Brown (personal communication) reports that, in the early part of the period under consideration, patients who had no visitors after their admission to hospital were significantly more likely to remain in hospital continuously for 2 years, and it is this group that accounts for some of the improvement in more recent figures. The assumption is that a substantial proportion of such patients remained in hospital because they had no home, and that nowadays other arrangements may be made for them.

The question of value remains for discussion. To what extent are patients being discharged who should remain in hospital? In a recent study of schizophrenic patients discharged after 2 years in a mental hospital, Brown, Carstairs, and Topping (1958) found that 17 per cent. could be said to be a severe, and 28 per cent. a moderate, social liability. However, the fact that readmission to Long Grove has not increased is reassuring in this respect. The scientist must perhaps suspend judgment, but the clinician will argue that every discharge from hospital involves the calculation of a risk, and that one can be over-cautious as well as over-optimistic. The point can only be settled by further research.

SUMMARY

Of a cohort of 162 schizophrenic patients admitted to Long Grove Hospital during the year July, 1950, to June, 1951, 62 (38 per cent.) stayed in hospital continuously for 2 years. The equivalent number for a cohort of 198 patients admitted 5 years later was forty (20 per cent.) For first admissions only, the numbers were twenty out of 70 (29 per cent.) and eight out of 65 (12 per cent.). The decrease was most marked for first-admission males and least for first-admission females. There was improvement even in those groups of patients whose prognosis seemed likely to be poor by reason of age, marital status, or social class. Patients were not more frequently re-admitted during the second 2-year follow-up period, although they had been discharged earlier. It has been argued that, of the many possible causes for such a change, intra-hospital factors are likely to have been of most importance for this particular sample, but further research is required to determine with precision the relative influence of the various factors considered, and the value of the recorded results.

REFERENCES

Brooke, E. (1957). Paper given at Int. Cong. Psychiat., Zürich.
Brown, G. W., Carstairs, G. M., and Topping G. (1958). *Lancet*, **2**, 685.
Carse, J., Panton, N. E., and Watt, A. (1958). *Ibid.*, **1**, 39.
Harris, A., and Norris, V. (1954). *J. ment. Sci.*, **100**, 241.
Kramer, M., Goldstein, H., Israel, R. H., and Johnson, N. A. (1955). *Publ. Hlth Monograph*, No. 32, Washington, D.C.
Macmillan, D. (1958). *Lancet*, **2**, 201.
Malzberg, B. (1952). *Ment. Hyg.*, **36**, 104.
Norris, V. (1956). *J. ment. Sci.*, **102**, 467.
Odegård, O. (1946). *Ibid.*, **92**, 35.
Shepherd, M. (1957). "A Study of the Major Psychoses in an English County". Maudsley Monograph, No. 3. Chapman and Hall, London.
Svendsen, B. B. (1952). "Psychiatric Morbidity among Civilians in Wartime". *Acta Jutlandica (Aarsskrift for Aarhus Universitet)*, **24**, Supplementum A. Munksgaard, Copenhagen.
Young, M., and Willmott, P. (1957). "Family and Kinship in East London". Routledge and Kegan Paul, London.

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TRAINING OF STUDENT NURSES

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The urgent need to minimize wastage among student nurses during training is too well known and well documented to require elaboration. Approximately one student out of every three joining the training schools of general hospitals fails to complete the prescribed course. The reasons for this failure vary, but are generally vague and indefinite. One approach to the problem is to compare the characteristics of those students who are successful in the final of the state registration examination with those who failed and/or left training before qualifying. In this way it may be possible to isolate factors related to the ultimate result of training.

The Oxford Area Nurse Training Committee, in conjunction with the Oxford Regional Hospital Board, is currently surveying four training schools in the region, and a preliminary report on the results has been published (Barr, James, and Smith, 1957). The purpose of the present paper is to record additional information and, in particular, to compare the successful and unsuccessful groups of students.

Methods and Material

The survey methods used and the material collected have been described elsewhere (Barr and others, 1957), but for convenience a brief summary is given. The survey includes all students joining four general hospitals during the years 1951 to 1954 inclusive. For the present paper, however, use is made of the data relating to the years 1951 to 1953 only, because various amendments were made to the syllabus of the General Nursing Council on January 1, 1954. A questionnaire (in the form of a Copeland Chatterson punch card) was devised to note such facts as year of joining, age, marital status, school-leaving age, social class of parents, etc. One card was completed by the matron for each student joining the training school during the survey period, and each student will be followed up for a minimum period of 4 years.

The hospital training schools were chosen to be as unlike as possible. It was hoped that the results would then be representative, to some extent, of the region as a whole. The number of related beds per hospital ranged from just over 100 to nearly 800 and the number of students per school enrolled during the 4 years ranged from 81 to 506. In all, 1,564 beds and 925 students are included in the survey. The theoretical maximum number of students for the 4 years was 1,149, so that in total the training schools were 81 per cent. full.

The following information is available for each student, at each of the four training schools surveyed, by each of the three intake years (1951-1953) with which this analysis is concerned:

Final result.
Length of service.
Age on entry.
Educational attainment before entry.
School-leaving age.
Social class of parents (for Hospitals A and D only).
Nationality.
Season of entry.
Pre-nursing course attended (for Hospital A only).

For obvious reasons, the hospitals are referred to anonymously.

Student Groups

As already indicated, the students are considered in two broad groups: (*a*) successful and (*b*) unsuccessful. Group (*a*) includes all students who passed the final of the state examination irrespective of whether they remained at the hospital or not after qualifying. Group (*b*) consists mainly of those

students who left with no qualifications or those who left with Parts I and II of the state examination. There were a few students in this group who were still at the hospital at the date of the analysis. It is possible that some of these students may qualify eventually, though each has already had a reasonable time for this. To this extent, the true number of successful students is probably understated by Group (*a*), but the possible deficit is small enough to ignore.

The analysis which follows is concerned with the differences between these two groups in terms of the various factors enumerated above. First, each factor is considered separately. Those found to be differently represented in the two groups have been examined later, in greater detail, because of possible interaction between them so as to isolate their independent contributions to the overall differences.

Length of Service

Of the students joining Hospital A in the 3 years 1951-1953, 16 per cent. left by the end of the first year, compared with 17, 22, and 14 per cent. respectively at Hospitals B, C, and D. By the end of the second year, the total percentage of students who had left was 22 at A, 27 at B, 32 at C, and 26 at D. Thus, at each training school, a greater proportion left during the first year than during the second, though at D the difference was small.

In Table I, annual wastage is related to the number of students starting each year's course. The expected number has been calculated on the null hypothesis, namely, that there is no difference in wastage rates between the hospitals for each year of training.

The number leaving during each year of training did not differ significantly (the conventional level of $P=0{\cdot}05$ is used throughout) between the hospitals. The differences were most marked in the third year, but this is understandable because of the number of nurses leaving to take up other posts on completion of their training.

Age on Entry

An age peak at 18 years characteristic of recruits at A was not found in the other three hospitals, where 17-year-olds featured more prominently. Older students (*i.e.* aged 25 and over) were commoner at B and C than at A and D. The average age of the students at entry is given in Table II (opposite).

At D, the mean age of all students was significantly less than for those at any of the other three training centres. The students at A were, on average, significantly younger than those at B and C, but there were no differences between the latter two schools

TABLE I

NUMBER OF STUDENTS AT BEGINNING OF EACH YEAR OF TRAINING, 1951-53, NUMBER LEAVING AND EXPECTED NUMBER LEAVING ON THE NULL HYPOTHESIS, BY TRAINING SCHOOL

Year of Training	Training School	Number Starting	Percentage Leaving	Number Leaving		Significance
				Observed	Expected	
1st	A	379	16·1	61	64·16	$\chi^2 = 1{\cdot}86$
	B	175	17·1	30	29·62	D.F. = 3
	C	91	22·0	20	15·41	$0{\cdot}70 > P > 0{\cdot}50$
	D	58	13·8	8	9·82	
	Total ..	703	16·9	119	119	
2nd	A	318	7·5	24	31·04	$\chi^2 = 3{\cdot}66$
	B	145	11·7	17	14·15	D.F. = 2
	C	71	12·7	9	6·93	$0{\cdot}20 > P > 0{\cdot}10$
	D	50	14·0	7	4·88	
	Total ..	584	9·8	57	57	
*3rd	A	294	52·4	154	143·94	$\chi^2 = 7{\cdot}47$
	B	128	53·9	69	62·67	D.F. = 3
	C	62	38·7	24	30·36	$0{\cdot}10 > P > 0{\cdot}05$
	D	43	25·6	11	21·05	
	Total ..	527	49·0	258	258	
All Years	A	379	63·1	239	233·99	$\chi^2 = 3{\cdot}56$
	B	175	66·3	116	108·05	D.F. = 3
	C	91	58·2	53	56·18	$0{\cdot}50 > P > 0{\cdot}30$
	D	58	44·8	26	35·81	
	Total ..	703	61·7	434	434	

Brackets indicate grouping of χ^2 test. * Includes students who left during third year and those leaving after qualifying.

TABLE II

MEAN AGE (WITH STANDARD ERROR) OF STUDENTS ON JOINING TRAINING SCHOOLS DURING THE THREE YEARS, 1951–1953

Training School	Student Group	Number of Students	Mean Age (yrs) with Standard Error
A	(*a*)	262	19·4 ± 0·14
	(*b*)	117	19·4 ± 0·17
	Total ..	379	19·4 ± 0·10
B	(*a*)	110	20·8 ± 0·48
	(*b*)	65	20·7 ± 0·52
	Total ..	175	20·8 ± 0·36
C	(*a*)	42	21·6 ± 0·71
	(*b*)	49	20·1 ± 0·45
	Total ..	91	20·8 ± 0·41
D	(*a*)	40	18·7 ± 0·29
	(*b*)	*17	17·9 ± 0·19
	Total ..	*57	18·5 ± 0·22

(*a*) Successful students. (*b*) Unsuccessful students.
* Excluding one student whose age was not stated.

that could not easily have arisen by chance. Taking the successful students separately, the mean ages were significantly greater at B and C than at A or D: the difference between A and D was not significant. For the unsuccessful groups, the mean age of students at D was significantly lower than at any of the other hospitals and that of students at A significantly less than that of those at B.

In the individual schools, there was little difference between the average ages of the two groups at A and B. At C and D, however, the unsuccessful were, on average, younger by about a year than the successful students, but only at D was the difference significant.

It seems likely that age on entry may be a factor associated with success and it is again considered later.

Educational Attainment Before Entry

The only assessment made of the standard of education before entering the training school was the possession or otherwise of either the school, general, higher, or other certificate of education. Four-fifths of the students at A held one or more of these certificates, compared with 24 per cent. at B, 19 per cent. at C, and 29 per cent. at D.

Table III shows that, apart from B, there was no material difference in the educational level between the two groups.

It would seem that the possession of an education certificate does not confer an overwhelming advantage in training for nursing, but, in view of the difference at B, this measure of education is reserved for re-consideration.

School-leaving Age

From what has been said in the previous sections on education and age on joining, it might be inferred that the average age of students at A on leaving the day school was somewhat higher than at the other hospitals. Very few of those joining at A had left school before 16 years of age, whereas several at the

TABLE III

NUMBER AND PERCENTAGE OF STUDENTS POSSESSING SCHOOL CERTIFICATES ON ENTERING TRAINING SCHOOLS DURING THE THREE YEARS, 1951–1953, BY TRAINING SCHOOL

Training School	Student Group	Educational Status			Percentage with Certificate	Test of Significance of Fourfold Table (D.F. = 1)
		Certificate	No Certificate	Total		
A	(*a*)	215	47	262	82·1	$\chi^2 = 1·47$
	(*b*)	89	28	117	76·1	$0·30 > P > 0·20$
	Total ..	304	75	379	80·2	
B	(*a*)	36	74	110	32·7	$\chi^2 = 11·11$
	(*b*)	6	59	65	9·2	$P < 0·001$
	Total ..	42	133	175	24·0	
C	(*a*)	8	34	42	19·0	$\chi^2 = 0·03$
	(*b*)	9	40	49	18·4	$0·90 > P > 0·80$
	Total ..	17	74	91	18·7	
D	(*a*)	13	27	40	32·5	$\chi^2 = 0·23$
	(*b*)	4	14	18	22·2	$0·70 > P > 0·50$
	Total ..	17	41	58	29·3	

(*a*) Successful students. (*b*) Unsuccessful students.

other training centres had done so. Table IV gives the average school-leaving age. For all students, the difference between the mean age on leaving school of the students at A was significantly greater than elsewhere, but at B, C, and D the mean ages were similar.

TABLE IV

MEAN AGE (WITH STANDARD ERROR) ON LEAVING DAY-SCHOOL OF STUDENTS JOINING DURING THE THREE YEARS, 1951–1953, BY TRAINING SCHOOL

Training School	Student Group	Number of Students*	Mean Age (yrs) with Standard Error
A	(*a*)	260	17·3 ± 0·05
	(*b*)	117	17·2 ± 0·08
	Total ..	377	17·3 ± 0·04
B	(*a*)	104	16·3 ± 0·11
	(*b*)	57	15·9 ± 0·14
	Total ..	161	16·1 ± 0·08
C	(*a*)	38	16·4 ± 0·20
	(*b*)	46	16·3 ± 0·19
	Total ..	84	16·3 ± 0·13
D	(*a*)	38	16·1 ± 0·14
	(*b*)	9	15·6 ± 0·11
	Total ..	47	16·0 ± 0·12

(*a*) Successful students. (*b*) Unsuccessful students.
* Excluding two at A, fourteen at B, seven at C and eleven at D, whose age on leaving day-school was not stated.

There was no material difference between the average age of successful and unsuccessful students at A and C. At B and D, however, the successful students were approximately 6 months older than the unsuccessful, and this difference was greater than that which could easily have arisen by chance. Because of these differences, school-leaving age is considered again later.

SOCIAL CLASS

Student nurses as a group are included in the Registrar General's Social Class III. Of greater interest in the present survey, however, is the social class grouping of the students' parents which is based normally upon the fathers' occupation. Such information was available only at A and D and is analysed in Table V. Nearly all students at these two hospitals were drawn from the three upper social classes.

The information available suggests that successful and unsuccessful students do not have different social class backgrounds.

NATIONALITY

Hospitals A and D had a much higher proportion of British students than Hospitals B and C. Only ten (3 per cent.) of the 379 students at A, and three (5 per cent.) of the 59 students at D were not British, and of these five at the former and one at the latter were Irish. In contrast, 49 (28 per cent.) of the 175 students at B and eighteen (20 per cent.) of the 91 students at C were not British; of these, forty at B and five at C were Irish. The percentage of foreign students (*i.e.* students whose national language was not English) was not large (1 per cent. at A, 5 per cent. at B, 14 per cent. at C, and 3 per cent. at D).

Because of the small number of non-British students in the survey, an analysis by individual training school is not possible. Therefore, in Table VI, the four centres are combined.

TABLE VI

NATIONALITY OF STUDENTS JOINING THE TRAINING SCHOOLS DURING THE THREE YEARS, 1951–1953

Nationality	Number Observed			Number Expected			Percentage Successful
	(*a*)	(*b*)	Total	(*a*)	(*b*)	Total	
British ..	404	219	623	402·33	220·67	623	64·8
Irish ..	35	16	51	32·94	18·06	51	68·6
European and Other	15	14	29	18·73	10·27	29	51·7
Total ..	454	249	703	454	249	703	64·6

$\chi^2 = 2{\cdot}48$, D.F. = 2, $0{\cdot}30 > P > 0{\cdot}20$
(*a*) Successful students. (*b*) Unsuccessful students.

TABLE V

SOCIAL CLASS OF PARENTS OF STUDENTS JOINING TRAINING SCHOOLS A AND D DURING THE THREE YEARS 1951–1953

Training School	Social Class	Number of Students			Percentage Successful	Test of Significance of Fourfold Table (D.F. = 1)
		Successful	Unsuccessful	Total		
A	I and II	140	72	212	66·0	$\chi^2 = 0{\cdot}85$
	III, IV and V ..	104	42	146	71·2	
	Total	244	144	358	68·2	$0{\cdot}50 > P > 0{\cdot}30$
D	I and II	10	3	13	76·9	Exact P
	III, IV and V ..	24	14	38	63·2	Single tail = 0·29
	Total	34	17	51	66·6	Double tail = 0·50

Details were not available in respect of 21 students at A and 7 at D.

The proportion of successful students was highest among Irish students and lowest among European and others, but the difference could easily have arisen by chance. As far as the present survey is concerned, nationality has little bearing on the outcome of training.

Season of Entry

Season of entry reflects to a large extent the local arrangement of the schools. At Hospital A, the intake was fairly constant throughout the year, though there was a slight tendency for more students to be recruited in the Autumn and Winter months than in the Spring and Summer. At B, the smallest intake took place during the Summer; at other times the number joining did not vary greatly.

As already noted, the percentage of successful students was highest at A and D and lowest at C and this pattern was maintained between the seasons. The overall distribution of students by season of entry is given in Table VII.

It can be concluded, therefore, that season of joining has no effect upon the final result.

Pre-Nursing Course

Except for Hospital A, very few students had attended a pre-nursing course. For this reason the analysis of this aspect (Table VIII) is confined to A alone.

The Table shows that the proportion of successful students was higher among those who had attended the pre-nursing course at the hospital than among those who had not for each year under review. For the three years combined, the difference was almost statistically significant. But as this only applies to Hospital A, it cannot conveniently be further considered.

Factors Influencing Results

Of the seven variables examined (age on entry, educational attainment before entry, school-leaving

Table VII

NUMBER AND PERCENTAGE OF STUDENTS JOINING THE TRAINING SCHOOLS DURING THE THREE YEARS 1951–1953, BY SEASON OF JOINING

Season	Number Observed			Number Expected			Percentage		
	(*a*)	(*b*)	Total	(*a*)	(*b*)	Total	(*a*)	(*b*)	Total
Spring	110	63	173	111·72	61·28	173	63·6	36·4	100
Summer	88	55	143	92·35	50·65	143	61·5	38·5	100
Autumn	112	57	169	109·14	59·86	169	66·3	33·7	100
Winter	144	74	218	140·78	77·22	218	66·1	33·9	100
Total	454	249	703	454	249	703	64·6	35·4	100

$\chi^2 = 1{\cdot}07$, D.F. = 3, $0{\cdot}80 > P > 0{\cdot}70$. (*a*) Successful students. (*b*) Unsuccessful students.

Table VIII

STUDENTS JOINING TRAINING SCHOOL A DURING THE THREE YEARS 1951–1953, ANALYSED BY ATTENDANCE AT PRE-NURSING COURSE

Year	Pre-Nursing Course	Number of Students			Percentage Successful	Test of Significance of Fourfold Table (D.F. = 1)
		(*a*)	(*b*)	Total		
1951	Attended	40	10	50	80·0	$\chi^2 = 0{\cdot}007$
	Not Attended	63	18	81	77·8	
	Total	103	28	131	78·6	$0{\cdot}95 > P > 0{\cdot}90$
1952	Attended	22	7	29	75·9	$\chi^2 = 0{\cdot}71$
	Not Attended	54	29	83	65·1	
	Total	76	36	112	67·9	$0{\cdot}70 > P > 0{\cdot}50$
1953	Attended	33	13	46	71·7	$\chi^2 = 2{\cdot}71$
	Not Attended	50	40	90	55·6	
	Total	83	53	136	61·0	$0{\cdot}10 > P > 0{\cdot}05$
1951–1953	Attended	95	30	125	76·0	$\chi^2 = 3{\cdot}66$
	Not Attended	167	87	254	61·0	
	Total	262	117	379	69·1	$0{\cdot}10 > P > 0{\cdot}05$

(*a*) Successful students. (*b*) Unsuccessful students.

age, social class, nationality, season of entry, and pre-nursing course), three (age on entry, educational attainment before entry, and school-leaving age) require further consideration because of differences found between the two groups. The social class of parents, nationality, season of entry, and attendance at a pre-nursing course did not appear to have any significant bearing upon whether the students were successful or not. There was, however, a tendency for students who had attended the pre-nursing course at Hospital A to experience a higher proportion of successes.

To examine how far age on entry, school-leaving age, and educational attainment before entry influenced the proportion of successes the 669 students, for whom this information was completed, have been classified into eight groups identified by combinations of the dichotomies of these three factors. The eight groups and the success rate in each are shown in Table IX.

The Table shows that there were significant differences between the eight groups, but this was largely due to the relatively low success rate among students who had left school at 16 years of age or under without a school certificate. Although, among those who left school later, the success rate of those with certificates were also higher than that of those without, the differences do not reach the level of technical significance. It is of interest to note that the highest success rate, 76·4 per cent., occurred in those aged 19 or over on entry who had left school with a certificate at 17 or 18 years of age. Little difference, however, was found between the success rate for this group and that for the equivalent group with no school certificates.

Discussion and Conclusions

Remarkably few objective studies have been made of the results of training student nurses, though the need for research in the field was stressed by the Ministry Working Party on the Recruitment and Training of Nurses (1947). The Working Party estimated that approximately 17 per cent. of nurses entered training before reaching the age of 18 years. The most popular year for entry appeared to be the nineteenth. Altogether half of the nurses entered before they reached the age of 20 and a half afterwards. One-third entered between their 20th and 26th birthdays, and 14 per cent. after reaching the age of 26. In the present survey, one-fifth of the students entered the training schools before their 18th birthday, which was a slightly higher proportion than was found by the Working Party. The most popular age for joining was 18 years for the four training schools combined, though at the three non-teaching hospitals (B, C, and D), more students joined at 17 than at any other single age. On the other hand, the proportion of older students in the present survey was lower (11 per cent. of the students in the present survey entered at 25 years or over). Thus, on the whole, the average age of the students in this survey tended to be less than that estimated by the Working Party.

Nearly half of the total number of nurses in hospitals, including students, in the Working Party's investigation, had received full-time education up to the age of 14 or 15 only. Another 30 per cent. had received some further education, part-time or full-time, without reaching school certificate standard, while one in every six had reached school certificate or matriculation standard but had not proceeded

TABLE IX

RESULTS OF TRAINING CLASSIFIED BY AGE ON ENTRY, AGE ON LEAVING SCHOOL AND EDUCATIONAL STATUS FOR ALL STUDENTS JOINING FOUR HOSPITALS DURING THE THREE YEARS 1951–1953 (EXCLUDES 34 STUDENTS FOR WHOM DETAILS WERE NOT COMPLETE)

Age on Entry (yrs)	School-Leaving Age (yrs)	Educational Status	Number of Students			Percentage Successful	Contribution to χ^2
			Successful	Not Successful	Total		
17, 18	14, 15, 16	Certificate	46	18	64	71·9	1·06
		No Certificate ..	67	56	123	54·5	6·97
	17, 18	Certificate	138	55	193	71·5	2·82
		No Certificate ..	15	9	24	62·5	0·11
19+	14, 15, 16	Certificate	26	13	39	66·7	0·01
		No Certificate ..	68	52	120	56·7	4·42
	17, 18, 19	Certificate	55	17	72	76·4	3·61
		No Certificate ..	25	9	34	73·5	0·91
Total			440	229	669	65·8	

$\chi^2 = 19{\cdot}91$, D.F. = 7, $0{\cdot}01 > P > 0{\cdot}001$

further. This contrasts sharply with the results of the present inquiry, which shows that four-fifths of the students had received full-time education beyond 15 years and that almost half of them held some form of school certificate.

Cross and Hall (1954) found that, for general hospitals in the Birmingham region, the proportion of successes was lowest at ages under 18 years. The present findings do not show the same marked discrepancies for students under 18 years. In fact, the 17-year-old students as a group compared very favourably with their older contemporaries as Table X shows.

TABLE X

COMPARISON OF RESULTS OF BIRMINGHAM SURVEY BASED ON STUDENTS ENTERING TRAINING SCHOOLS OF GENERAL HOSPITALS IN 1946 (CROSS AND HALL, 1954) AND OXFORD SURVEY OF STUDENTS JOINING FOUR GENERAL HOSPITALS DURING 1951–1953

Age on Entry to Training School (yrs)	Birmingham Survey		Oxford Survey	
	Total Students	Percentage Successful	Total Students	Percentage Successful
Under 18	154	39·0	145	67·6
18–	207	51·7	274	62·4
19–	117	46·2	95	65·3
20–24	274	48·2	136	65·4
25+	102	52·9	52	65·4
Total* ..	854	47·7	702	64·7

* Excludes students whose ages were unknown.

The two surveys differ markedly both in regard to overall results and also in regard to ages. This may be due to the fact that the Birmingham survey was carried out in the immediate post-war years when working conditions were rather unstable, to differences in the type of area and the quality of the recruits, or to differences in the composition of the samples. Of these, the time of conducting the survey seems to be the most likely explanation of the differences. By the Nurses' Rules Approval Instrument of 1951 (General Nursing Council, 1952), the minimum age for entering nurse-training schools after August 1, 1952, was fixed at 18 years, so that the number of 17-year-old recruits declined rapidly after 1952 at all four hospitals surveyed.

As might be expected, there is no clear-cut division between successful and unsuccessful students. An examination of the three most important variables (age on entry, age on leaving school, and educational attainment before entry) shows that, among comparable groups of students, the possession of a school certificate is likely to make the most difference to success in the group entering training and leaving school comparatively early. For other students a school certificate is an advantage, though not significantly so. The importance of an education certificate appears to diminish as the school-leaving age increases. This suggests that perhaps the interim period between leaving a day school and joining a training school is worth special consideration.

For practical purposes the present analysis indicates that the worst results are obtained by students who left school early without a school certificate irrespective of the age at which they entered the training school.

SUMMARY

Successful and unsuccessful student nurses who joined four general hospital training schools in the Oxford region during the calendar years 1951-1953 inclusive have been analysed according to their final result, length of service, age on entry, educational attainment before entry, school-leaving age, social class of parents (for two hospitals only), nationality, season of entry, and attendance at a preliminary training course (for one hospital only).

No clear distinction emerged between the successful and unsuccessful students, but the practical conclusion drawn from the analysis is that the success rate was lowest among students who left school early with no education certificate, irrespective of the age at which they entered the training school.

Thanks are due to the Matrons of the four hospitals for supplying the basic data. I am also indebted to Dr. E. A. Cheeseman, of the Department of Social and Preventive Medicine, the Queen's University, Belfast, for considerable help and advice in preparing this paper.

REFERENCES

Barr, A., James, I., and Smith, H. M. V. (1957). *Monthly Bull. Min. Hlth.* **16**, 94.

Cross, K. W., and Hall, D. L. A. (1954). *Brit. J. prev. soc. Med.*, **8**, 70.

General Nursing Council and Ministry of Health (1952). "The Nurses' Rules, Approval Instrument, 1951". Statutory Instruments, 1951, vol. 2, p. 105. No. 1372, H.M.S.O., London.

Ministry of Health, Department of Health for Scotland, and Ministry of Labour and National Service (1947). "Report of the Working Party on the Recruitment and Training of Nurses". H.M.S.O., London.

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SOCIAL CLASS DISTRIBUTION OF RESPIRATORY TUBERCULOSIS MORTALITY IN NORTHERN IRELAND, 1949-53

BY

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The occupational and social class distribution of mortality in Northern Ireland has not been previously studied, because suitable data have only recently become available. The Registrar General for Northern Ireland (1955) included, for the first time in a census report, the age and social class distribution of the adult male population in 1951. As no official analysis of mortality by social class is contemplated, this paper presents the social class distribution of respiratory tuberculosis mortality for males, using the published population data and the death registrations for 1949–53 made available through the courtesy of the Registrar General for Northern Ireland. The analysis is limited to male mortality, because no population data for married women classified by husband's occupation has yet been published.

Material

The classification procedures and methods of presenting the data follow closely those used by the General Register Office (1956) and the Registrar General for England and Wales (1958a, b) so that comparison between the two countries can be made.

In Northern Ireland in 1949–53 there were 1,254 deaths of males aged 15 years and over which were attributed to respiratory tuberculosis. Of the men who died, 1,198 (95·5 per cent.) were classified as "occupied or retired", including the active, out of work, and retired. The remaining 56 (4·5 per cent.) were classified as "unoccupied"; this group is thus exclusive of the retired and out of work. These terms are used in the same sense as in the official reports for England and Wales (*e.g.* Registrar General for England and Wales, 1958a). As the "unoccupied" group contains only a small number of registered deaths from respiratory tuberculosis, this group has been omitted throughout this report. Classification of the relevant death certificates as in England and Wales (General Register Office, 1956), according to occupation last followed by the deceased and then by social class, showed that there were twenty deaths in Social Class I (Professional), 156 in Class II ("Intermediate"), 502 in Class III (Skilled), 117 in Class IV (Partly skilled) and 403 in Class V (Unskilled).

Results

Table I shows the conventional standardized mortality ratios (S.M.R.s) for all ages from 15 years and over. The large standard error for Social Class I raises doubts whether, in fact, mortality in this class is heavier than in Social Class II; consequently the Table also shows the S.M.R. for these two classes combined. The S.M.R. in Social Class V was about twice as great as in Social Class III, and that in Social Class III about twice as great as that in Social Classes I and II combined. The S.M.R. for Social Class IV is very much lower than would be expected from the mortality gradient implied by the remaining social classes, being, in fact, similar to that of the highest Social Classes I and II combined.

TABLE I

RESPIRATORY TUBERCULOSIS MORTALITY AMONG MALES AGED 15 YEARS AND OVER IN NORTHERN IRELAND (1949–53) REGISTERED AND EXPECTED DEATHS BY SOCIAL CLASS

Social Class	Registered Deaths	Expected Deaths	S.M.R. ± S.E.*
I (Professional) ..	20	31·62	63 ± 14·1
II (Intermediate) ..	156	316·44	49 ± 3·9
I and II Combined ..	176	348·06	51 ± 3·8
III (Skilled) ..	502	447·85	112 ± 5·0
IV (Partly Skilled) ..	117	230·85	51 ± 4·7
V (Unskilled) ..	403	198·60	203 ± 10·1
Unoccupied	56	28·64	196 ± 26·1
All Males	1,254	1,254	100

* Standardized mortality ratio ± standard error

S.M.R.s, though convenient in this context, can be misleading as indices of the variations in mortality which might occur between the social classes at particular ages. Therefore in Table II the age specific rates are shown. Unfortunately the total male population concerned (474,209) is small, so that at some ages the rates are based on small numbers and must be interpreted with caution. If attention is confined to the rates for Social Classes I and II combined, III, IV, and V, certain constant factors nevertheless emerge (Table II). Thus, at each age group, except 15 to 19 years, Social Class V has the highest rate and, except at 65–69 years, Social Class III has the next highest rate. Social Classes I and II combined have the lowest rate in five age groups and Social Class IV the lowest rate in three. The rates for Social Classes I and II combined and for Social Class IV are very similar in each age group (Table II), as suggested by the S.M.R.s for these groups (Table I). In general the rates are more divergent between social class at the higher than at the lower ages.

TABLE II

RESPIRATORY TUBERCULOSIS MORTALITY AMONG MALES IN NORTHERN IRELAND (1949–53) BY AGE AND SOCIAL CLASS
AVERAGE ANNUAL NUMBER OF DEATHS PER 100,000 OF THE POPULATION AT STATED AGE GROUP IN YEARS

Age Group (yrs)	Social Class			
	I and II	III	IV	V
15–19	(31)	(10)	(3)	(24)
20–24	(13)	22	(15)	65
25–34	(23)	49	27	79
35–44	31	52	(20)	115
45–54	39	91	40	150
55–64	33	139	32	192
65–69	52	(56)	(64)	174
70+	25	58	(36)	90

Note: In this and subsequent Tables the rates in brackets are based on less than twenty deaths.

To facilitate comparison with data for England and Wales, the S.M.R.s for Northern Ireland have been restricted to age 20–64 years; this limitation makes no material difference to the gradient or to the exception observed in Table I from the S.M.R.s based on ages 15 and over. Table III shows the S.M.R.s for the two countries by social class. In England and Wales the S.M.R.s for Social Classes III and IV are very similar (102 and 95 per cent. respectively) and, moreover, as is seen in Table IV, at each age group, the average annual age specific rates for these two social classes are also similar. Thus, in England and Wales, mortality differences due to respiratory tuberculosis appear to have been negligible between Social Classes III and IV. In England and Wales, Social Classes I and II combined have the lowest, while Social Class V has the highest rate in each age group, and the range of the rates is greatest at the older ages (Table IV). Thus the relative rankings of the social classes are not inconsistent with that already noted for Northern Ireland; except that Social Class IV in England and Wales has a similar mortality experience to Social Class III, whereas in Northern Ireland the experience of Social Class IV resembles that of Social Classes I and II combined.

The S.M.R.s (Table III) for Social Classes I and II combined are 48 per cent. for Northern Ireland and 62 per cent. for England and Wales, indicating that mortality in these classes in England and Wales was nearer to the average mortality of that country, after allowance for age, than was the mortality in these

TABLE III

RESPIRATORY TUBERCULOSIS MORTALITY AMONG MALES AGED 20–64 YEARS IN NORTHERN IRELAND AND ENGLAND AND WALES (1949–53)
REGISTERED AND EXPECTED DEATHS BY SOCIAL CLASS

Social Class	Northern Ireland			England and Wales		
	Registered Deaths	Expected Deaths	S.M.R. ± S.E.	Registered Deaths	Expected Deaths	S.M.R. ± S.E.
I	15	27·17	55 ± 14·3	619	1,060	58 ± 2·3
II	116	246·66	47 ± 4·4	3,129	4,992	63 ± 1·1
III	446	388·44	115 ± 5·4	15,722	15,465	102 ± 0·8
IV	91	192·89	47 ± 4·9	4,687	4,945	95 ± 1·4
V	345	170·36	203 ± 10·9	6,136	4,302	143 ± 1·8
I and II	131	273·83	48 ± 4·2	3,748	6,052	62 ± 1·0
III	446	388·44	115 ± 5·4	15,722	15,465	102 ± 0·8
IV and V	436	363·25	120 ± 5·7	10,823	9,247	117 ± 1·1
IVa (Agricultural workers)	21	97·92	21 ± 4·7	639	1,075	59 ± 2·4
IVb (Others in partly skilled occupations) ..	70	94·97	74 ± 8·8	4,048	3,870	105 ± 1·6
Occupation Code 950 (Social Class V) ..	304	45·89	662 ± 38·0	2,380	932	255 ± 5·2
All Others in Social Class V	41	124·47	33 ± 5·1	3,756	3,370	111 ± 1·8

classes in Northern Ireland to the average of that country; but Table IV shows that the rates for England and Wales are slightly lower than those for Northern Ireland up to about age 50, but that thereafter they are appreciably greater (Figure). Table IV also suggests that for Social Class III the mortality in Northern Ireland is slightly greater than in England and Wales at all ages under 65 years (Figure).

For Social Class IV the S.M.R.s differ widely in the two countries. In each age group the Northern Ireland rates for Social Class IV are lower than those for England and Wales, the difference in the older age groups again being much greater than in the younger (Figure). In order to explain this apparent geographic difference in mortality for Social Class IV, the data were divided into two groups, IVa (agricultural workers) and IVb (others in partly skilled trades). In Northern Ireland, about 50 per cent. of males aged 15 and over in Social Class IV were agricultural workers (IVa) compared with just over 26 per cent. for England and Wales. In both countries the S.M.R.s for agricultural workers (IVa) are much lower than those for the remaining partly-skilled workers (IVb) (Table III). With only one exception, this is true of the age-specific rates shown for each country for Social Classes IVa and IVb in Table V. Moreover, in both Social Classes IVa and IVb, the corresponding age-specific rates are lower in Northern Ireland than in England and Wales in all age groups except 65 and over for Social Class IVa and 25–34 for Social Class IVb. Thus the generally low mortality in Social Class IV in Northern Ireland compared with England and Wales would appear to result from the facts that this class includes relatively more agricultural workers in Northern Ireland than in England and Wales, and that in Northern Ireland agricultural workers have a lower mortality rate in most age groups.

For Social Class V, the rates shown in Table IV and in the Figure (opposite) suggest that males in Northern Ireland have a much higher mortality

TABLE IV

RESPIRATORY TUBERCULOSIS MORTALITY AMONG MALES IN NORTHERN IRELAND AND AND ENGLAND AND WALES (1949–53) BY AGE AND SOCIAL CLASS
AVERAGE ANNUAL NUMBER OF DEATHS PER 100,000 OF THE POPULATION AT STATED AGE GROUP IN YEARS

Age Group (yrs)	Social Class									
	I and II		III		IV		V		IV and V	
	Northern Ireland	England and Wales	Northern Ireland	England and Wales	Northern Ireland	England and Wales	Northern Ireland	England and Wales	Northern Ireland	England and Wales
15–19*	(31)	(3)	(10)	5	(3)	8	(24)	13	(11)	10
20–24	(13)	10	22	17	(15)	21	65	26	34	23
25–34	(23)	17	49	31	27	29	79	45	48	36
35–44	31	24	52	39	(20)	36	115	56	65	44
45–54	39	41	91	64	40	59	150	94	97	75
55–64	33	58	139	101	32	91	192	129	112	110
65–69	52	66	(56)	114	(64)	101	174	143	114	123
70+	25	49	58	69	(36)	63	90	82	58	72

* Age group 16–19 yrs in England and Wales data

TABLE V

RESPIRATORY TUBERCULOSIS MORTALITY AMONG MALES IN NORTHERN IRELAND AND ENGLAND AND WALES (1949–53), BY AGE AND SUB-DIVISIONS OF SOCIAL CLASSES IV AND V
AVERAGE ANNUAL NUMBER OF DEATHS PER 100,000 OF THE POPULATION AT STATED AGE GROUP IN YEARS

Age Group (yrs)	Social Class IV				Social Class V			
	IVa (Agricultural Workers)		IVb (Others in Partly Skilled Occupations)		Occupation Code 950		All Others in Social Class V	
	Northern Ireland	England and Wales	Northern Ireland	England and Wales	Northern Ireland	England and Wales	Northern Ireland	England and Wales
15–19*	(3)	4	(4)	11	(64)	(15)	(12)	12
20–24	(13)	15	(20)	23	199	65	(12)	16
25–34	(12)	21	49	31	275	94	(8)	32
35–44	(5)	27	(36)	38	378	95	(16)	46
45–54	(15)	36	60	65	462	164	(31)	74
55–64	(16)	47	(44)	104	659	220	(33)	103
65–69	(57)	49	(66)	125	1,724	258	(14)	110
70+	(71)	37	(33)	80	1,525	134	(13)	64

* Age group 16–19 yrs in England and Wales data

FIGURE

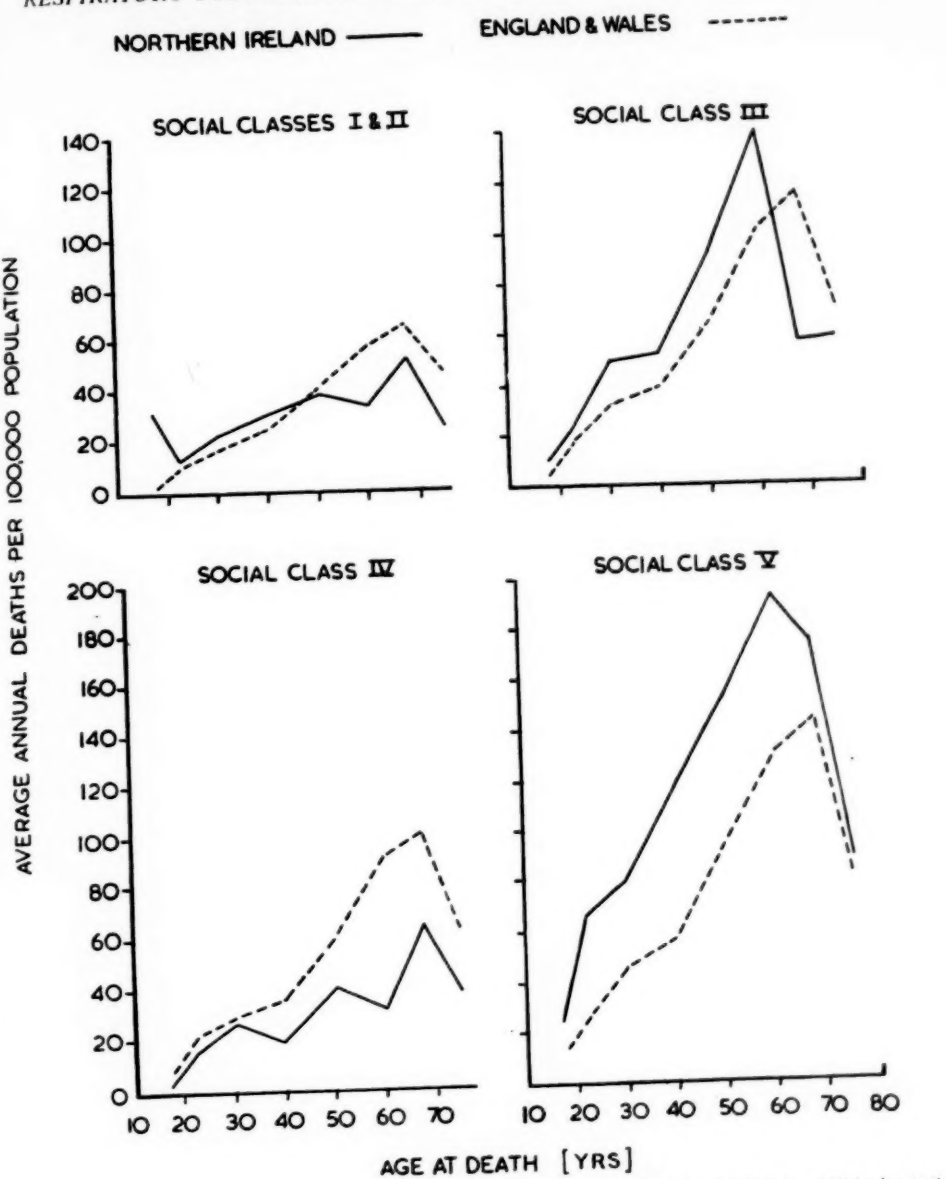

FIGURE.—Death rates per 100,000 population per annum from respiratory tuberculosis in Northern Ireland and in England and Wales, by age at death and social class.

from respiratory tuberculosis than those in England and Wales. In the Northern Ireland Social Class V population, 24·4 per cent. of males were coded as 950 (labourer—"all other industrial and commercial undertakings") (Registrar General for Northern Ireland, 1958) compared with 21·9 per cent. for England and Wales. However, in Northern Ireland it was found that about 88 per cent. of all deaths from respiratory tuberculosis in Social Class V were those of persons whose occupation was coded as 950 compared with about 39 per cent. for England and Wales. This fact and also the fact that the Registrar General for England and Wales (1958b) found that the S.M.R. for this occupation group was 255 per cent. compared with 143 per cent. for Social Class V as a whole could explain the relatively high S.M.R. for Social Class V in Northern Ireland, 203 per cent. compared with 143 per cent. in England and Wales. For Code 950, the Northern Ireland age-specific death rates are three to twelve times larger than the corresponding rates for England and Wales, while in the other occupations of Social Class V the rates in Northern Ireland are consistently lower than the corresponding rates in England and Wales.

The obvious explanation of these differences is that "labourers" (Code 950) in Northern Ireland do, in fact, experience a much heavier mortality from respiratory tuberculosis than labourers in England and Wales, while others in Social Class V and agricultural workers in Social Class IV under age 65 experience a somewhat lower mortality in Northern Ireland than corresponding groups in England and Wales. It has been suggested that these differences in the mortality of labourers (Code 950) may be attributable to some social factor such as a persistently higher level of unemployment in Northern Ireland. Unfortunately the published data on unemployment is not available in sufficient detail to prove or disprove this hypothesis.

An alternative explanation for the high mortality in labourers (Code 950) might be that classification of unskilled and partly-skilled jobs at death registration is less exact in Northern Ireland than in England and Wales. Thus some of the deaths at present classified in the labourers' group (Code 950) in Northern Ireland might, in fact, be more appropriately classified in other sub-groups of Classes IV and V.

However, it is impossible to decide which of these explanations is the more likely, or what part each plays in producing the differences observed in the rates. Therefore it seems wise to make comparisons between the two countries for a combined group of Social Classes IV and V. The S.M.R.s for this combined group are shown in Table III, and the age-specific rates in Table IV for each of the two countries. Up to age 65 the rates in Northern Ireland are greater than those in England and Wales, but thereafter the reverse is true.

Summary

In Northern Ireland the mortality from respiratory tuberculosis for males aged 15 and over is similar in Social Classes I and II combined and Social Class IV. Social Class III has approximately double this mortality, while Social Class V has roughly twice the mortality of Social Class III. It is possible that because of poor definition of labouring occupations at death registration, these S.M.R.s should, in fact, be lower for Social Class V and higher for Social Class IV. It seems safer, therefore, to express the social class distribution of respiratory tuberculosis mortality for males in Northern Ireland in terms of three social class groups formed by I and II combined, III alone, and IV and V combined. The S.M.R.s for these groups are then 48, 115, and 120 per cent. respectively. However, the trend implied by these S.M.R.s is not consistent throughout the age groups.

Comparison of data for Northern Ireland with those for England and Wales reveals several important differences in this aspect of mortality. In Social Class IV the Northern Ireland males had a lower mortality at all ages, the difference in the two areas being least in the younger age groups. This result may be partly explained by the facts that the proportion of agricultural workers in Northern Ireland is about double that in England and Wales, and that such workers had a lower mortality than the remainder of Social Class IV in the two countries. Social Class V mortality at all ages was found to be greater in Northern Ireland than in England and Wales and this may be explained either by a real difference in mortality or by differences in the precision of recording occupations on death registration certificates.

When Social Classes IV and V are combined, the Northern Ireland rates are the higher until about age 60, and thereafter the England and Wales rates are the higher.

I am indebted to Mr. L. C. Mulligan, the Registrar General for Northern Ireland, for granting me access to the information about Northern Ireland necessary for this report, and to Dr. W. P. D. Logan for supplying me with unpublished information about occupation Code 950 in England and Wales. My thanks are also due to Mrs. Dorothy Hutton for typing the manuscript and to Miss E. E. Thornbury for preparing the figures.

REFERENCES

General Register Office (1956). "Census, 1951. Classification of Occupations." H.M.S.O., London.
Registrar General for England and Wales (1958a). "Decennial Supplement, England and Wales, 1951." Occupational Mortality, Part II, vol. 1: Commentary. H.M.S.O., London.
——for England and Wales (1958b). "Decennial Supplement, England and Wales, 1951." Occupational Mortality, Part II, vol. 2: Tables. H.M.S.O., London.
Registrar General for Northern Ireland (1955). "Census of Population of Northern Ireland, 1951." General Report. H.M.S.O., Belfast.
——for Northern Ireland (1958). Personal communication.

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NOTICES

SOCIETY FOR SOCIAL MEDICINE

The third Annual General Meeting of the Society was held at Queen's College, Dundee, by the kind invitation of Professor A. Mair, from September 18–20, 1959.

The following communications were given:

Symposium on "Respiratory Dust Diseases" (Dundee Department of Social Medicine and Dr. R. S. F. Schilling)

Age Trends in Different Occupational Groups and Social Classes" (Dr. L. Stein)

An Investigation into the Need for Hospital Admission among 4,274 Patients in Birmingham Hospitals" (Dr. J. M. Mackintosh and Dr. F. N. Garratt)

"Absenteeism and Accidents in Industry in Relation to Smoking Habits" (Dr. C. R. Lowe)

"Health and Housing" (Miss Ann Cartwright)

"Serum Proteins in a Population Sample of Males aged 65–85" (Dr. R. M. Acheson and Prof. W. Jessop)

"Secular Pattern of Congenital Oesophageal Atresia" (Dr. E. G. Knox)

"Uptake of Polio Vaccine among School Children on a London Out-County Estate" (Mrs. M. Jefferys)

"Cancer—the Significance of Delay" (Dr. R. Sutherland)

"Further Extractions from Data collected during the Survey of Childhood Malignancies" (Dr. J. W. Webb)

"Physique as a Risk Factor in Pregnancy" (Dr. A. M. Stewart)

"Prognostic Indications in the Family Background of Backward Children" (Dr. M. Susser)

"Some Observations on the Marital State, Occupation, and Domicile of Patients with Perforated Ulcer in North-east Scotland" (Dr. R. D. Weir)

SOCIÉTÉ FRANÇAISE DE MÉDECINE PRÉVENTIVE ET SOCIALE

A scientific meeting of the Société Française de Médecine Préventive et Sociale was held at St. Malo on September 3–7, 1959, the principle topic being the Medico-Social Problems of Adolescence.

INTERNATIONAL SOCIETY FOR PROPHYLACTIC MEDICINE AND SOCIAL HYGIENE

The Eighth International Congress for Prophylactic Medicine and Social Hygiene will take place at the University of Innsbruck, Tyrol, Austria, on September 3–6, 1960.

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